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Implementation of Multidose Drug Dispensing in a Home Care Setting

Changes in Safety of Medicines Management

Thesis for the degree of Philosophiae Doctor

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Norwegian University of Science and Technology
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Implementering av multidose i en kommunal hjemmetjeneste: Innvirkning på sikkerhet i legemiddelhåndteringen

Multidose er tabletter og kapsler pakket maskinelt i poser for hvert doseringstidspunkt. I 2005 besluttet Trondheim kommune å innføre multidose til brukere i hjemmetjenesten. På det tidspunktet var effektene av multidose mangelfullt dokumentert. Kommuneledelsen i samarbeid med NTNU, besluttet derfor å studere implementeringen. Multidose ble gradvis innført i 2006.

Tre studier ble gjennomført for å undersøke kvaliteten og sikkerheten i legemiddelhåndteringen for pasienter i hjemmetjenesten før og etter innføringen av multidose. Samlet sett har studiene et komplekst design, med både interne og eksterne kontroller, og før - etter undersøkelser. Kvalitative så vel som kvantitative data ble samlet inn, og disse la grunnlag for metode-, kilde- og observatørtriangulering.

Innføringen av multidose førte til bedre samsvar mellom medisinlistene hos fastlegene og hos hjemmetjenesten. Videre fant vi at medisinlistene hos fastlegene samsvarte bedre med medisinlistene på apotek enn hos hjemmetjeneste etter innføring av multidose. Imidlertid viste det seg at samsvaret for legemidler som administreres utenfor multidosesystemet (f.eks. øyedråper og inhalatorer) hadde en tilsvarende forbedring for den enkelte multidosebruker. Dette funnet tyder på at et økt fokus på legemiddelhåndteringen med informasjon- og opplæringstiltak samt nye rutiner som avklarer oppgaver og ansvarsforhold hos de ulike aktørene (fastlegekontor, apotek og hjemmetjeneste), var avgjørende. Funnene viser også at selv om antall uoverensstemmelser mellom medisinlister ble redusert, var forekomsten av avvik fortsatt høy. Dette forteller at flere tiltak og et kontinuerlig fokus på legemiddelhåndteringen er nødvendig for å etablere og opprettholde god kvalitet.

Fastlegene så vel som farmasøytene rapporterte om bedre oversikt over pasientenes legemidler og dermed bedre kontroll. Involvert helsepersonell fortalte også om økende tillit til hverandre og til multidosesystemet etter hvert som nye rutiner ble implementert. Likevel ble tilliten til multidosesystemet utfordret av redusert fleksibilitet. Det opplevdes blant annet som vanskeligere å gjøre fortløpende endringer i medisineringen

sammenliknet med i det tidligere manuelle systemet som benyttet dosettesker. I tillegg uttrykte sykepleierne bekymring for at automatiseringen ville svekke deres kunnskap om den enkelte pasientens medisinering, og dermed gjøre dem mindre kompetente til å observere legemidlenes effekter og eventuelle bivirkninger hos pasienten. Fastlegene mente at elektronisk kommunikasjon kunne forenkle og forbedre utvekslingen av legemiddelinformasjon, og dermed bedre betingelsene for multidosesystemet.

Fastlegene i Trondheim viste en positiv holdning til multidose. Det ble rapportert økt arbeidsmengde, men likevel ønsket de fleste fastlegene at multidosesystemet skulle videreføres. For å gjøre koordineringen i multidosesystemet mindre kompleks, besluttet Trondheim kommune at kun pasientens fastlege kunne forskrive legemidler til multidosepakkene. Den tydelige ansvarliggjøringen av fastlegene tvang dem til å ta et større ansvar for sine pasienters legemidler. Forbedrede rutiner og samhandling mellom fastleger, apotek og hjemmetjenesten omfattet imidlertid bare pasienter som var mottakere av multidose. Tilsvarende forbedringer skjedde ikke for pasienter som brukte vanlige dosettesker, selv om disse pasientene hadde samme fastlege og samme hjemmetjeneste som pasientene med multidose.

I Trondheim førte innføringen av multidose til bedre kvalitet og sikkerhet i legemiddelhåndteringen for pasienter i hjemmetjenesten. Denne avhandlingen viser imidlertid at det viktigste bidraget til bedre kvalitet var vektleggingen av de ulike trinnene i legemiddelhåndteringen, bedre kommunikasjon og samarbeid mellom involvert helsepersonell, og avklaring av oppgaver og ansvar. Funnene kan ikke uten videre generaliseres, men innsikten som presenteres i denne avhandlingen kan være gyldig for andre som planlegger å innføre multidose eller som allerede bruker multidose i hjemmetjenesten.

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Summary

Multidose dispensed drugs are drugs machine-packed into dose unit bags for each time of administration. Trondheim municipality decided in 2005 to implement Multidose Drug Dispensing (MDD) in home care services. At that time, there was a lack of scientific knowledge about the effects of MDD. The health care management of Trondheim therefore decided to study the implementation in collaboration with NTNU. MDD was adopted gradually during 2006.

Three studies were conducted with the common main aim of investigating the safety of medicines management during the implementation of MDD. A complex intervention was designed, including both internal and external controls, and pre-post-examinations. Qualitative as well as quantitative data was gathered, forming a method-, data source-, and observer-triangulation.

The introduction of MDD reduced the discrepancies between the medication lists at the general practitioners (GPs), and in the home care services, and even moreso between the GPs and the pharmacies. However, for patients with multidose dispensed drugs, a corresponding improvement also occurred for drugs they received outside the MDD system (e.g. eye drops and inhalers). This finding suggests that new routines, and better collaboration between health practitioners, more than the MDD system by itself, contributed to the improvements. Nevertheless, even if the number of discrepancies between medication lists were reduced, the discrepancies continued to be high, demonstrating that more efforts are needed.

Other reported improvements also occurred. Both the general practitioners and the pharmacists reported a better overview of the patients' medication and thus a better control. The involved health care practitioners also stated an increased trust in each other, as well as in the MDD system, as better collaboration emerged. However, trust in the MDD system was challenged by a loss of flexibility to make changes in medication/dosage compared to the manual system. The nurses in the home care services expressed that the automation would decrease their knowledge of patients' drug intake, and thus make them less trusted in observing patients. The GPs believed that

electronic communication could improve the exchange of information and updating, and thus produce an even better effect from the MDD system.

The GPs in Trondheim showed a positive attitude to MDD. Increased workload was reported, but still most GPs wanted the system to be continued. The decision to only allow the patient's GP to prescribe multidose dispensed drugs contributed to the improvements seen in routines of prescription, communication, and cooperation. The decision made the GPs take on a greater responsibility with their patients' medications, and made the coordination in the MDD system less complex. However, the improved routines and collaboration between GPs and home care services and pharmacies, only related to patients receiving multidose dispensed drugs. The improvements were not transferred to other patients on the GP's list having drugs administered by the home care services.

The introduction of MDD in Trondheim was followed by improved quality in the medicines management. This thesis shows, however, that the main contribution to improved safety was emphasizing the different steps of the medicines management, to improvements in communication and cooperation between health care practitioners, and the clarifying of roles and responsibilities. The findings cannot be generalized straight forwardly. However, insights from the three studies presented in this thesis should be valid for others planning to implement an MDD system, or already using MDD in the home care services.

List of papers

The thesis is based on the following papers:

Paper I:

Wekre LJ, Spigset O, Sletvold O, Sund JK and Grimsmo A, (2010): Multidose drug dispensing and discrepancies between medication records. Qual Saf Health Care 19(5): e42.

Paper II:

Wekre LJ, Melby L and Grimsmo A, (2011): Early experiences with the multidose drug dispensing system - A matter of trust? Scand J Prim Health Care 29: 45-50.

Paper III:

Wekre LJ, Bakken K, Garåsen H and Grimsmo A, (2012): GPs' prescription routines and cooperation with other healthcare personnel before and after implementation of multidose drug dispensing. Scand J Public Health, 40(6): 523-530

List of abbreviations

ADE	Adverse Drug Events
EHR	Electronic Health Record
GP	General Practitioner, doctor in primary care
IMM	Integrated Medicines Management
MDD	Multidose Drug Dispensing
MMC	Medicines Management Chain
MRC	Medical Research Council www.mrc.ac.uk/index.htm
NOK	Norwegian kroner
NSEP	Norwegian EHR Research Centre www.ntnu.no/nsep
OP	Ordinary Prescriptions

1. Background

Multidose dispensed drugs are drugs machine-packed into dose unit bags for each time of administration (Sinnemaki et al. 2013). This thesis presents experiences with multidose drug dispensing (MDD), based on the implementation of such a system in the home care services in Trondheim. An important issue is the cooperation between different groups of health personnel involved in the medicines management chain (MMC). The patient's GP, the nurses in the community home care services, and the pharmacists at the pharmacies, as well as the GP medical secretaries, are all central actors in the MMC.

1.1 Medicines management chain

A medicines management chain (MMC) is a collaborative chain. Collaboration in chains may be characterised as a sequential flow of tasks, where the actors work relatively independently (Paulsen et al. 2013).

For patients living at home and in need of assistance in managing their medications, a complex and time consuming information sharing process takes place between numbers of different organizations: Home care services, GPs, pharmacies, and the MDD supplier. In addition, emergency units, nursing homes, rehabilitation services, and hospitals are often involved, as well as the patient and his or her friends and family. Each organization has to exchange and revise relevant information on their patients manually (Bakken et al. 2007).

MMC may be divided into several processes or steps. A model used by the Joint Commission for Accreditation of Healthcare Organizations in the USA (later named The Joint Commission) considered five steps in MMC: prescribing, dispensing, administering, monitoring, and systems control (Nadzam 1991). Other models suggest four steps: ordering, transcription, dispensing, and administration (Leape et al. 1995) or, as based on observations of MDD in Trondheim: prescribing, ordering, dispensing, and administration (Hamre et al. 2010).

As outlined above, an MMC includes a range of components; from human resources to technology. Firstly, the doctor concludes on medication; sometimes a straight forward

decision and in other cases, a decision based on the set of information seen in the medication of elderly patients with several chronic diseases (involving human resources). Thereafter, the doctor writes the prescription – mostly nowadays done electronically (involving both human resources and technology). The next steps usually involve the pharmacy supplying the patient or the institution with medicines (involving both human resources and technology). If the medicines delivered from the pharmacy are pre dispensed, an MDD supplier is involved (involving technology). In the end, the patient or a helper (e.g. home care services) administers the medicines (involving human resources, and sometimes technology). However, this is a diagrammatic view, and sometimes the process can be different.

Each actor in an MMC is responsible for given tasks and for transferring the responsibility for the patients' medications to the next actor. The next actor in the chain depends heavily on what the preceding actors have done. When work is organized into a sequential flow of tasks, the actors involved relate to each other asymmetrically (Paulsen et al. 2013). This in contrast to symmetrical collaboration, where actors meet in reciprocal encounters or face to face.

New technology often creates additional work, as the individual actor does not gain the greatest benefit, but rather the next actor in the chain. Experience gained may encourage greater use (Grudin 1994). Thus, the new system should also seek to give all actors an advantage in one way or another to create a win-win situation (Grudin 1994).

However, it has been claimed that the actor's position in the chain is highly important for attitudes and motivation towards the collaboration, and that collaborative profit is greatest for the last actor in the chain (Barimani and Hylander 2008). To compensate for the missing motivation among actors, formalized procedures may be established (Nylen 2007).

Research shows that the quality of collaboration is affected by a number of factors in the organizational situation (Paulsen et al. 2013), and MDD may put in play several of these factors. Central factors discussed by others are organizational culture, conflicting professional attitudes, and lack of economic incentives (Anthony and Hudson-Barr

1998; Van Raak et al. 2005). Other important factors are timing, as well as distribution of tasks among actors involved (Paulsen et al. 2013).

1.1.1 Obstacles hampering safety in the MMC

Medication errors occur frequently in treatment with drugs and occur in all steps in the MMC (Runciman et al. 2003; Friedman et al. 2007). This may be due to poor communication about drug use or incomplete medication information (Glintborg et al. 2007; Kripalani et al. 2007). Transferring patients between different levels of care is also associated with medication errors (Midlov et al. 2005).

When looking at the different steps in the MMC, the preventable adverse drug events (ADE) among elderly in primary care most often occur during prescribing (58%), and monitoring (61%), but errors involving patient adherence (21%) are also fairly common (Gurwitz et al. 2003).

Drugs are used frequently. Thus, the total number of preventable medication errors are costly (Cresswell et al. 2007). Hence, improving the MMC contains substantial potential for reducing the number of medication errors (Bates 1996). A study from the United States with elderly patients (65 years or older) receiving at least five prescriptions, estimated that the medication record reflected the reported medications accurately in only 5% of the patients (Kaboli et al. 2004). Norwegian studies have shown that there are discrepancies in the medication records in as many as 90% of patients receiving home care services (Jensen et al. 2003). On average, there are 25% more drugs listed in the medication records at the home care services than at the GP (Rognstad and Straand 2004).

Repeat prescriptions account for over 80% of the total drug prescriptions, and a need for a repeat prescribing system to minimise the risk of ADE is emphasised (Zermansky 1996; Avery et al. 2002).

As already mentioned, transferring a patient between hospital and primary care is an event associated with medication errors. Medication errors may be due to poor communication about drug use when transferring patients from primary care to the hospital (Cornish et al. 2005; Midlov et al. 2005; Orrico 2008; Frydenberg and Brekke

2012), or at discharge from the hospital (Glintborg et al. 2007; Kripalani et al. 2007). A study from the United Kingdom considered readmission to hospital to be related to medication for 38% of the patients, and to be preventable for 61% of these (Witherington et al. 2008). Further, a Swedish study found errors in 25% of the drug orders to the MDD supplier at discharge from hospital (Alassaad et al. 2011).

In addition, a Danish study found that only 14% of changes made in MDD drugs during hospitalization were communicated to the GP or to the community pharmacy. In the same study, discrepancies between medication lists from the hospital at discharge, and medication lists at home, were found in 50% of the patients (Reuther et al. 2011). These findings show that poor communication routines at discharge are also problematic in the MDD system.

Within primary care, both the GPs and nurses in the home care services, depend on well-functioning collaboration - and communication routines. This is necessary to provide medical treatment for their shared patients. Thus, a synchronised and up-to-date overview of the medications of their patients is essential for both parties. Inaccurate medication records may cause medication errors and adverse drug events. Unfortunately, research has shown that even when changes in medication at other points in the MMC are communicated to the GP, not all GPs regularly update their medication records (Rognstad and Straand 2004; Bakken et al. 2007; Mandt et al. 2009; Rahmner et al. 2010).

Further, when more than one physician is involved in the care of a patient, there are higher risks of medication errors (Bedell et al. 2000; Green et al. 2007). A Swedish study has also demonstrated a negative correlation between the quality of prescribing and the number of prescribers per patient in nursing homes using MDD (Olsson et al. 2010).

The preceding paragraph describes risks related to gaps. Gaps are discontinuities in care, and appear during interruptions in task solving, or when transferring information between actors. Mostly, health personnel are able to detect gaps, and act to avert failure (Cook et al. 2000). However, increased automation of work processes has been shown to make the processes less transparent to the collaborative actors, reducing the ability of

health personnel to prevent errors (Perry et al. 2005; Hamre et al. 2010). This has to do with a reduction in the many informal, preventive mechanisms (Ash et al. 2004); the pharmacists routinely check the doctors' prescriptions, nurses check the drugs that were dispensed by the pharmacist, and so on. In manual processes, the chance of detection and prevention of errors is shown to increase with the number of actors involved in the process (Leape et al. 1995). Restructuring of the MMC may inadvertently eliminate some of these important and preventive mechanisms (Cook et al. 2000; Ash et al. 2004).

1.1.2 Initiatives promoting safety in MMC

Medication errors and ADEs have received considerable attention during the last 15-20 years. In the report "To Err Is Human" (Kohn et al. 2000), it was indicated that the most frequent patient treatment inflicted injuries are drug-related. Prevention of drug related patient injuries was also one of six priority areas for a large U.S. patient safety campaign in 2004 (100 K campaign). The American Institute of Healthcare Improvement (IHI) has developed several recommendations for action within this area (www.ihi.org/imap).

Internationally, several models have been developed to promote safety. The Integrated Medicines Management (IMM) model is based on a systematic approach to individualise and optimise drug treatment. The service is delivered across organisations and by a range of collaborating health personnel (Scullin et al. 2007). The IMM model covers all aspects of medicines management, starting with the prescription and ending with the patient's use of the drugs. The overall goal is to achieve the best outcome for the patient at minimised costs (Scullin et al. 2007; Hellstrom et al. 2011; Ghatnekar et al. 2013).

An IMM model from Northern Ireland was developed further in Sweden: the Lund Integrated Medicines Management (LIMM) model (Bergkvist et al. 2009; Hellstrom et al. 2011). In 2009, this model was introduced in Central Norway (Andersen et al. Accept. for publ.).

A recent initiative is the Norwegian patient safety campaign, "In Safe Hands". This campaign was launched in January 2011 by the Norwegian Ministry of Health. Prevention of drug-related patient injuries was one 'in advance', priority area in the

planned national patient safety campaign (Lauvrak and Norderhaug 2010). The three-year campaign aims to reduce patient harm, and involves both specialist health care and primary health care. Medication reconciliation is an example of a focus area to improve the quality of medication lists in primary and secondary care. The campaign was focused on manual work processes to improve safety.

1.1.3 Drug use among the elderly in MMC

Elderly people make up the majority of drug users in the community. Numbers from the Norwegian prescription database shows that 91% of the elderly (65 years or older) received at least one prescription in 2011 (Rønning et al. 2012). Moreover, the elderly often use several drugs: 57% of the elderly use more than five drugs, while for the younger population, the proportion is less than 20% (Rønning et al. 2012).

Although medications can alleviate symptoms and reduce elderly patients' morbidity and mortality, drugs may also represent a potential danger through ADEs (Hanlon et al. 1997). Problems in prescribing for the elderly arise from both the over-and under-prescribing of medication therapies (Rochon et al. 1999). Several characteristics of ageing, such as decreased renal function and altered fat and water distribution, as well as potential mental impairment, make elderly patients particularly vulnerable to drug-related harm (Rognstad et al. 2009; Ruths and Straand 2010). This means that great awareness is required when prescribing drugs or making dose adjustments for elderly patients (Wyller and Laake 2001).

Polypharmacy is most commonly defined as concomitant use of five or more medications and is frequently seen in the older population (Viktil et al. 2007). In a Danish study among 212 elderly patients exposed to polypharmacy, the great majority of the patients (94%) had one or more inappropriate prescription (Bregnhoj et al. 2007).

It is also shown that people with polypharmacy are associated with poor adherence (Wandless et al. 1979; Gryfe and Gryfe 1984; Griffith 1990; Barat et al. 2001). Further, it has been shown that persons living alone, and receiving more than three drugs from multiple prescribers, are at a higher risk of poor adherence (Barat et al. 2001). The relation between cognitive function and adherence shows, however, conflicting results (Barat et al. 2001). Interestingly, a recent study from the Netherlands reported that older

patients receiving multidose dispensed drugs had higher medication adherence compared to patients receiving manually dispensed drugs, despite a lower knowledge and lower cognitive function among the MDD users (Kwint et al. 2013).

1.2 Multidose drug dispensing

With MDD, patients receive their drugs machine-dispensed into dose units. The dose unit bags are labelled with patient data, drug content data, and time for intake (Bakken and Straand 2003; Bergman et al. 2007; Johnell and Fastbom 2008). All prescriptions are ordered through a local pharmacy, which electronically forwards the orders to an MDD supplier. Dispensed drugs are sent to the pharmacy, and the home care services deliver and sometimes administer the MDD drugs to the patients (Halvorsen et al. 2011).

Figure 1-1: Multidose dispensed drugs packed for two weeks use

MDD has been promoted as a tool to ensure better medical treatment for patients with polypharmacy and/or with a limited ability to maintain appropriate medication use. MDD is assumed to be particularly suitable for patients enrolled in home care services, and long-term residents of institutions (e.g. nursing homes), due to the reduction of manual dispensing (Price Waterhouse Coopers 2007).

Further, MDD is expected to reduce medication errors, improve adherence, and reduce the waste of unused drugs (Riksförsäkringsverket 2001; Statens Helsetilsyn 2002; Kostiainen and Hyyppä 2004; Danish Medicines Agency 2006; Price Waterhouse Coopers 2007; Australian Government Department of Veterans' Affaires 2012). However, scientific evidence of these effects is missing (Nordling et al. 2009). In spite of the lack of scientific documentation, national authorities have voiced a strong confidence in the MDD system (Riksförsäkringsverket 2001; Helse- Og Omsorgsdepartementet 2005).

In the home care services, the initiators for implementation of MDD are most commonly the municipal authorities or the municipal healthcare management. The main motivation is toward better quality, while improved effectiveness is also an important consideration.

1.2.1 Multidose drug dispensing in Europe

In Norway, MDD was first introduced to patients in the city of Drammen at the beginning of the 1990s (Apotekforeningen 2010). However, it was not before Farmaka, now one of the main MDD suppliers in Norway, started their production at the end of 1999 that the marketing of the MDD system started. Still, it took considerable time to convince potential customers about the MDD product (pers. com. Cristina W. Haug).

The number of MDD users in Norway in the years 2006-2012 is presented in Table 1-1. The table shows an extensive growth over the last seven years, with about 58,000 users in 2012 (Apotekforeningen 2013). However, it has been estimated at a potential inclusion of 70 000–120 000 patients from the primary care services until the year 2015 (Apotekforeningen 2013). Of the current MDD users, about 80% are enrolled in the home care services (Apotekforeningen 2013).

Table 1-1: The number of users of multidose dispensed drugs in Norway during the years 2006-2012

	2006	2007	2008	2009	2010	2011	2012
Number of multidose users in Norway	16,000	22,000	31,000	35,000	44,000	53,000	58,000
Growth from the previous year		39%	43%	14%	23%	21%	9%

Sweden is the leading MDD country in Scandinavia, with about 182,000 users (Sjoberg et al. 2011), while Denmark had 63,000 users in 2012 (Statens Serum Institut 2013). Likewise, in The Netherlands the number of community dwelling MDD users increased strongly in recent years to 360,000 in 2011 (Kwint et al. 2013). MDD has also been introduced in Finland. It was implemented through legislation in 2011, and the number of MDD patients is currently about 20,000 (Sinnemaki et al. 2013).

1.2.2 Multidose drug prescription forms

Details about prescription form and content is provided in the public regulations concerning the requisitioning and dispensing of drugs from pharmacies (Helse- Og Omsorgsdepartementet 1998). The regulations say that multidose dispensed drugs might be prescribed through a medication list, where all the drugs of the patient, independent of drug classification (A, B or C), are listed. However, the prescription of class A-drugs (narcotics) must additionally be accompanied by a prescription form as required for this class of drugs. In the MDD list, the dosage and time for intake of the individual drug has to be specified. Just as with most other prescriptions, the medication list is valid as a prescription for one year.

The multidose drug prescription form is not yet included in the Norwegian ePrescribing.

1.2.3 Multidose drug dispensing and potential inappropriate drug use

Swedish studies indicate that MDD users may be more exposed to potential inappropriate drug use (Bergman et al. 2007; Johnell and Fastbom 2008; Olsson et al.

2010). This is partly explained by higher drug use among multidose drug users than among patient receiving ordinary prescription (OP). It is suggested that the multidose drug prescription form may be regarded as complicated, hence resulting in uncritical renewal of prescriptions (Johnell and Fastbom 2008).

This concern is supported by another Swedish study looking at the association between MDD and drug treatment changes in older hip fracture patients. The findings show that MDD is associated with fewer changes in drug treatment compared to OP (Sjoberg et al. 2012). Likewise, a register based cross-sectional study showed that the greatest differences between MDD users and patients with OP were found to be related to quality indicators concerning the number of drugs; ten or more drugs, and three or more psychotropic (Sjoberg et al. 2011).

However, Swedish MDD users seem to have a lower probability of potentially serious drug-drug interactions (Johnell and Fastbom 2008; Sjoberg et al. 2011). One explanation may be that drug-drug interactions warnings based on the complete medication list of the patients are given in the MDD prescribing procedure (Sjoberg et al. 2011).

A Norwegian cross sectional study among MDD users in Norwegian nursing homes and home care services, found that more MDD users in nursing homes (31%) had potentially inappropriate drug use compared to MDD users in home care services (25%). Especially, increased co-prescribing of multiple psychotropic drugs was of great concern (Halvorsen et al. 2011). Still, the study suggests that MDD systems have potential for systematically identifying potentially inappropriate medications and drug-drug interactions. Further, it was claimed that screening of patients' medication records, and feedback to prescribers should be mandatory, to assure prescription quality in the MDD system (Halvorsen et al. 2011).

1.2.4 Safer medicines management with multidose drug dispensing

MDD may serve to enhance medication safety among primary healthcare patients (Sinnemaki et al. 2013). Still, even if automated dispensing systems are known to reduce dispensing errors (Klein et al. 1994), safety in the whole MMC may not be improved. An observation study conducted in three nursing homes using MDD in the

Netherlands, found a mean error frequency of 21% during the administration step of the MMC (Van Den Bemt et al. 2009). The most frequently occurring types of error were faulty administering techniques, especially incorrect crushing of medication. Further, safer management of medications demands that adequate procedures for drugs that cannot be included in the MDD system are also maintained (Heier et al. 2007; Van Den Bemt et al. 2009).

A Danish study indicated that MDD did not improve compliance (Larsen and Haugbolle 2007), while a study from the Netherlands claimed the opposite (Kwint et al. 2013). In addition, the multidose drug bags have been reported to be difficult to open (Søndergaard et al. 2005; Price Waterhouse Coopers 2007). Despite this, most medication users thought multidose dispensed drugs are an easier and safer solution than the traditional dose dispensers used in manual packaging (Figure 1-2) (Price Waterhouse Coopers 2007).

Figure 1-2: A traditional dose dispenser on top of a medication record. The tweezers are used to grip the tablets when placing them into the correct partition of the dispenser

According to official reports, the number of errors in dispensing are dramatically reduced with MDD (Riksförsäkringsverket 2001; Statens Helsetilsyn 2002). Yet when it comes to any effects on patient safety, health, and quality of life, scientific documentation is missing (Price Waterhouse Coopers 2007; Nordling et al. 2009). This means that any increase in safety as an effect of MDD is experience-based rather than evidence-based (Herborg et al. 2008).

One hypothesis has been that MDD can help reveal ambiguities between the prescriber, the pharmacy, the home care services, and the patient, thus helping to stimulate a more secure MMC. Norwegian studies have shown discrepancies between the medication record in the home care services and at the GP for patients receiving MDD (Bakken and Straand 2003; Heier et al. 2007). The earliest study (Bakken and Straand 2003) examined the rate of discrepancies that arose between what the doctor prescribed and the entries used by the home care services in three home care districts. The study showed that the rate of discrepancies were similar among MDD users (21%) and patients with OP (17% in one district and 33% in another district). One example of error in the district with MDD was that the doctor informed the home care services and not the pharmacy about changes made to the medication.

In the second study (Heier et al. 2007), medication lists for 95 patients from three home care districts were collected from the GPs and home care services. These were compared for any disagreements. Discrepancies were found in 52% of the patients. Changes in medication were seen 20 times per month for every 100 users of MDD. On average, 19% of the patients in this study got manually dispensed medicines in addition to, or instead of, multidose dispensed drugs.

The high rate of discrepancies was considered unacceptable in both studies. The common conclusion was that it is important to clarify who is responsible for the patients that are enrolled in home care services actually getting their prescribed medications. If a positive effect is achieved by the MDD system, it depends on the tasks and procedures introduced simultaneously.

1.3 Theoretical framework

1.3.1 Complex interventions

Complex interventions – consisting of multiple behavioural, technological, and organizational components – are common and important features of health care practice and research (May et al. 2007). Implementation of MDD in primary care falls within the definition of complex interventions.

Complex interventions comprise a number of components, which may act both independently and interdependently, and it is often difficult to tease out the relationships between them (Medical Research Council 2000; May et al. 2007). Thus, research related to evaluation of complex interventions in big organizations is challenging, as problems may arise in developing, identifying, documenting, and reproducing the intervention (Campbell et al. 2000). But drawing on theories can help to conceptualize a problem and thus address it systematically (Campbell et al. 2007). The Medical Research Council's (MRC) evaluation framework (Medical Research Council 2000) brought welcome clarity to the task. In 2008, the MRC updated its guidance (Craig et al. 2008a).

The MRC guide argues that almost all interventions, delivered by clinicians or research staff, are complex (Craig et al. 2008a). It is also claimed that complex interventions may work best if tailored to local circumstances rather than being completely standardised (Craig et al. 2008b).

1.3.2 Work-arounds

Health care professionals seek to balance technological and regulatory demands with the need to provide patient-centred care, in an efficient and cost-effective manner. They may simultaneously see a need to improvise or work around intended working routines to cope with time pressures and other obstacles. Such 'work-arounds' are frequently cited in the context of serious patient safety consequences (Halbesleben et al. 2008).

It is shown that the introduction of quality and safety actions often cause changes in clinical processes. If the changes represent major practical obstacles, or are considered as unnecessary, or not meaningful, in order to complete the work, staff will redesign the

work processes to minimize the obstacles or to counter adverse effects. This does not happen suddenly, but often gradually over time (Ash et al. 2004; Halbesleben et al. 2008).

The web of human and technological interactions steadily going on in complex organisations typically involves humans solving problems with limited resources and working around imperfect processes (Coiera 2003). Knowledge about 'work-arounds' encountered during the implementation of new technology is shown to be of great importance (Vogelsmeier et al. 2008). To understand 'work-arounds', it is vital to know the workflow prior to, and during, the implementation.

1.3.3 The Normalisation Process Theory

Research on organizational development, technology implementation (especially ICT Information and Communication Systems) has developed a variety of theories anchored in sociology, computer science, economics, and management, etc. The Normalisation Process Theory (NPT) was developed by Carl May and his colleagues over the last decades as an attempt to adapt implementation theory to the health domain (May 2006).

NPT theoretically assists in explaining the processes by which complex interventions become routines embedded in the daily health care practice (May et al. 2007). The model offers a framework for prospective process evaluation and also for comparative studies of complex interventions (May et al. 2007).

The model focuses both on factors that promote, and factors that inhibit, the embedding of complex interventions into routines of health care practice (May 2006; May et al. 2007; May et al. 2007; May et al. 2009; Murray et al. 2010). Further, in addition to studying endpoint outcomes, May and colleagues underline the necessity of evaluating social relations and work-related processes that lead to those outcomes. This they do in order to understand what produces the effectiveness of the intervention (May et al. 2007).

In particular, NPT guides attention to the processes by which complex interventions are made workable and integrated into everyday practice. Changes are produced by a range of social mechanisms described as sense-making work (coherence), engagement work

(cognitive participation), the work of enacting a practice (collective action), and the work of understanding and appraising its effects (reflexive monitoring) (May et al. 2009).

Normalisation is not the only possible outcome from an intervention. Other alternatives include: *adoption*, where a complex intervention is taken up, but does not become routinely embedded in everyday work, and *rejection*, where users refuse a complex intervention. De-normalisation may also occur during the lifetime of a complex intervention. Thus, normalisation is neither an automatic outcome, nor a permanent one (May et al. 2007). Some have claimed that the implementation requires on-going efforts to keep up the desired routines and effects of an intervention (Hanseth et al. 2006).

2. Aim and study questions

The motivation for doing this research was the lack of documentation of effects of MDD, despite growth in the use of MDD in the period of planning the studies. The MDD system is mainly used in the home care services and offered to the elderly. The complexity both in the medicines management chain, and in the medication use among elderly, made the research area interesting and challenging from a pharmaceutical point of view. Also, from a health policy perspective, it was important to pay attention to the process of implementing MDD to point out success factors and possible challenges.

The main aim of this thesis was to study possible changes in the safety of medicines management when implementing MDD in home care services. In relation to the model of Hamre et al, the main focus of this thesis has been on the step of prescribing, ordering and administering, and less on the step of dispensing.

To achieve the aim, three studies were conducted. The overall aim was operationalized in four research questions:

RQ-I: How does the introduction of MDD in a home care setting affect the number and nature of inconsistencies when comparing medication records from the GPs and the home care services?

RQ-II: How do different groups of health professionals experience the change in the medicines management chain due to medication safety?

RQ-III: How do the different actors in the medicines management chain alter their collaborative behaviour, roles, routines, and responsibilities when implementing MDD?

RQ-IV: How do the GPs' attitude towards the MDD system change during the introduction of the system?

Table 2-1: The relation between research papers and research questions

	Paper I	Paper II	Paper III
RQ-I	X	X	
RQ-II		X	X
RQ-III		X	X
RQ-IV			X

3. Methods

3.1 The MDD project

The decision to implement MDD in the home care services in Trondheim was made by the municipal political authorities. The aim was improved quality in medicines management for the patient in the home care services. Thus, a two year MDD project was established to prepare, implement, and evaluate the introduction of MDD.

The project was established in October 2005, and ended in September 2007. In total, there were 12 project meetings during this period. The project organization comprised the MDD project manager, the MDD Project Group, and MDD contact persons.

The project group consisted of eight members representing the different actors in the MMC. Two persons represented the home care services, one person represented the GPs, one person represented the local pharmacy, and one person represented the MDD supplier. In addition, two project members came from the medical chief executive staff in Trondheim, and one of these was the project manager. The author of this thesis participated in the project group both as a project member (community pharmacist), and as a researcher (PhD-student). All members of the multidisciplinary project group were health personnel (nurses, physicians, pharmacists, and an ergonomist). There were no changes in the group throughout the two year project period.

Most groups of actors in the MMC appointed an MDD contact person: Each of the 27 different home care units appointed their own MDD contact person and so did the five pharmacies involved in MDD. Further, some GP practices appointed a GP medical secretary to be an MDD contact as well.

For the MDD implementation project, an intranet website was established for publishing information about the project, minutes, written procedures, and so on.

The four home care districts had different start-up times when introducing MDD for their patients: February, May, September and December, in 2006.

3.2 Setting

3.2.1 Study place

The study was conducted in Trondheim and Tromsø, Norway, in the years 2005-2007. At that time, around 3000 people in Trondheim received home care, including 1800 receiving assistance in medicines management. Health care assistants and nurses represented around 500 man-years, and were organised into four geographical districts. The city of Trondheim had around 130 GPs during the study period, and five out of 17 pharmacies were involved in MDD. The city of Tromsø served as a control in Paper III. Tromsø had 52 GPs at the time, and had not planned to implement MDD in the home care services.

3.2.2 Information and training

The members of the MDD project group were mainly involved in the information and teaching work. Additionally, the MDD contact persons at the different home care units, and in the pharmacies, had a responsibility for these tasks (information and teaching) within their own unit. In the pharmacies, the teaching was organized by the pharmacies together with the MDD supplier.

The MDD contact persons at the different home care units, and at the pharmacies, received information directly from the MDD project group. They were responsible for communicating the information to their colleagues. In addition, mandatory information meetings about the MDD system, and the new routines, were held for all employees in the home care services who were involved in the medicines management before the implementation started.

The home care services were responsible for providing the patients with information about MDD. Special information folders were composed and distributed to patients in the home care services (Anon 2005). This folder included the following headings: “What is multidose?”; “Who gets multidose?”; “What is improved?”; “How is multidose distributed?”; “What is the cost?”; “Who decides if you will receive multidose?”; “Why implementing multidose?”

In addition, the MDD project group worked out written procedures for the handling of multidose dispensed drugs based on written procedures from the municipality of Stavanger. After approval by the medical chief executive of the municipality, the written procedures were made available on the intranet website of the MDD project.

The GPs were informed about MDD in mandatory meetings, and written information was distributed. To make sure that all the information was made accessible, the procedures and information were gathered in a loose-leaf binder and distributed to the different GP practices. The MDD project manager paid a visit to the GP practices upon request. During implementation, a need was identified to provide the GP medical secretaries with information about MDD as well. Therefore, the GP practices were asked to appoint a contact person among their GP medical secretaries. This appointed GP medical secretary was responsible for following up the internal routines for prescription of multidose dispensed drugs.

3.2.3 The local multidose drug dispensing system

Figure 3-1 shows the formal MMC in the local MDD system. In Trondheim, the local procedure regulated the multidose packages to include only medications listed in the GPs medication record. Prescriptions made by other prescribers had to be evaluated by the patient's GP in order to be handled within the MDD system. Thus, in Trondheim, only GPs had the exclusive right to prescribe in the MDD system.

For patients receiving multidose drugs from the home care services, supply usually covers two weeks of use. If changes in the medications are made during this period, a repack may be ordered by the home care services. Alternatively, the home care services may choose to handle the changes manually by transferring the remaining multidose drugs into a pill dispenser, or giving an additional drug outside the multidose bags. However, changes may also be postponed until the next dispensing period.

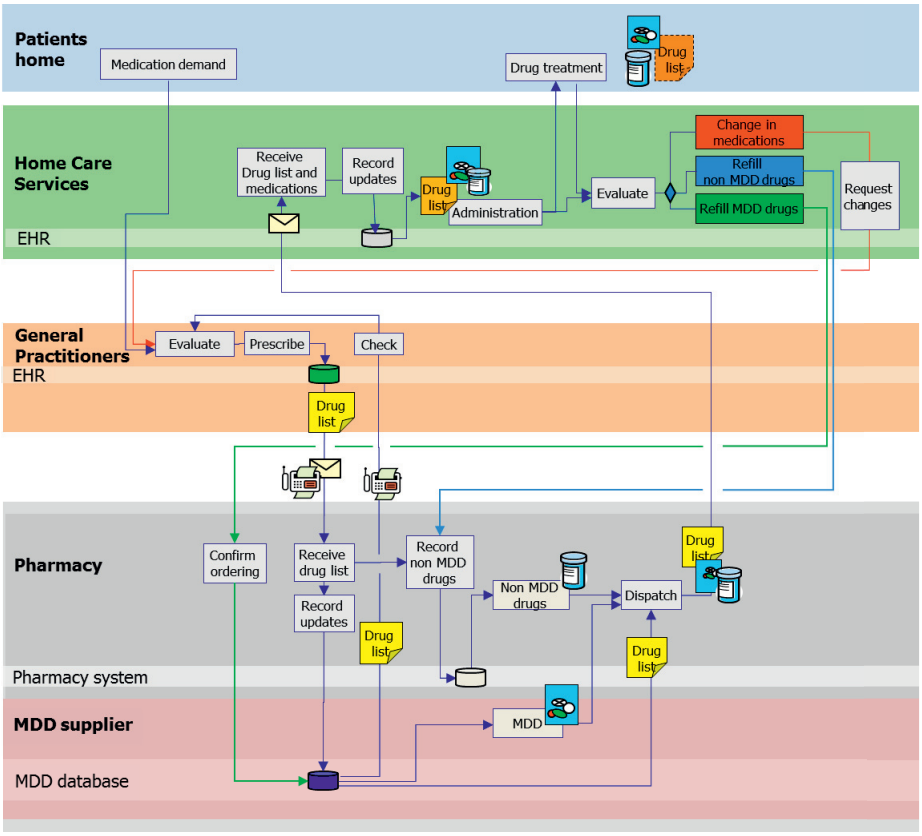

Figure 3-1: The local medicines management chain within the multidose drug dispensing (MDD) system shown in a swim-lane diagram. Names of the different actors are written to the left in the diagram. When the actor had an electronic health record or another electronic system used in the MDD system, it is placed within the relevant actor's box. The pharmacy and the MDD supplier is located in a common box since these actors chaired access to the multidose database, and information from the multidose database was also electronically loaded into the pharmacy system. The major steps in medicines management chain are shown as boxes. The order of the activities is moving from the left to the right. A "Drug list" is the complete medication record of the patient. The beige drug list was the one from the general practitioners and this was the prescription source in the multidose system. The yellow drug list was the medication list printed from the multidose database, while the orange drug list was the medication list registered at the home care services. A print of the drug list from the home care services was supposed to be handed over to the patient. In the model it is given a dashed frame as it was not always updated. ''EHR'' is an abbreviation for electronic health record. "MDD" is an abbreviation for multidose drug dispensing.

3.3 Paper I

The first paper explores the state of discrepancies in medication records at the GP's office, and in the home care services before, and after, the implementation of MDD.

3.3.1 Participants

Ten home care units from two out of four home care districts in Trondheim recruited between 12 and 15 patients each for participation. The first 15 patients fulfilling the inclusions criteria were selected from the alphabetical patient list at each unit. In the end, 59 patients were included in the study.

Inclusion criteria:

- Written informed consent was obtained from the patient
- The patient received assistance in medicines management by the home care services
- The patient was given drugs from a dose dispenser (before the implementation of MDD)

Exclusion criteria:

- The patient lived in sheltered housing with care beds

3.3.2 Design

Paper I was a controlled pre-post study with pair design of patients' medication records. In addition to a pre-post comparison of drugs administered in multidose packages, an internal control was obtained by comparing changes in the patient's multidose administered drugs to the drugs administrated outside the MDD system.

Medication records from the GPs and from the home care services were collected at two point of times: six months before, and one year after the start-up with MDD. In the post study, medication records from the pharmacies were provided as well.

The MDD contact persons in the home care units recruited patients to the study. Further, the home care services were responsible for printing the medication records from their electronic health record (EHR) and collecting print-outs from the medication records at the GPs office for the pre-study. In the post-study, medication records for patients who were still users of the home care services, and still receiving MDD drugs,

were collected by the PhD student. This was done by sending a request for medication records directly to the patient's home care unit, the patient's GP, and to the pharmacy involved.

3.3.3 Measures and data analyses

The main measures in Paper I were pre- and post-measurement of discrepancies in the medication records at the GP office and at the home care services. The drugs were divided into three groups: 1) multidose drugs 2) non-multidose drugs (drug formulation not suitable for MDD) 3) drugs prescribed to be used as required.

Discrepancies caused both by conflicting prescriptions, and by missing information in the medication records, were registered, in line with previous suggestions (Barat et al. 2001; Bakken and Straand 2003; Jensen et al. 2003; Rognstad and Straand 2004; Arora et al. 2007). The sum of discrepancies in the pairs of medication records was registered and so was the sum of prescriptions in the medication record of the GPs (defined as the master record). The pairs of medication records with one or more discrepancy were counted as well.

Discrepancies were rated into one of three classes according to whether they had minimal (Class 1), moderate (Class 2) or severe potential (Class 3) to harm patients. In addition, a fourth class of non-classifiable discrepancies (Class 0) was included. Similar classifications of discrepancies have been used by others who found the rating appropriate (Cornish et al. 2005; Arora et al. 2007).

The rating of discrepancies was done by an expert group consisting of two pharmacists, a GP, a clinical pharmacologist, and a geriatrician. Each member of the group made an individual assessment before the joint evaluation. In cases of disagreement about the inconsistencies, the issue was resolved through discussion. Two meetings were arranged to disclose disagreements. Consensus was reached in all cases. The members of the group were blinded with regard to whether the records they inspected were collected before or after MDD was implemented.

Furthermore, sum of risk scores in each pair of medication records were calculated by giving a Class 1 discrepancy 1 point, a Class 2 discrepancy 2 points, and a Class 3 discrepancy 3 points. Class 0 discrepancies gained no points.

Thus, to study the severity of the discrepancies, medication records at high-risk were defined by the following criteria:

- Records where the sum of risk-scores were six or higher, or
- Records containing one or more Class 3 discrepancies

Analyses were completed using Microsoft Office Excel and SPSS. The statistical analyses used were the Student t-test for paired samples for continuous data and the McNemar test for paired nominal data.

3.3.4 Sample size calculation

Based on data from previous studies (Bakken and Straand 2003; Jensen et al. 2003; Rognstad and Straand 2004), we expected to find discrepancies in 80% of the medication records before intervention took place. In view of the numbers, we decided to consider discrepancies in 50% of the medication records in the post measure to be regarded as a positive effect of the intervention. Sample size was calculated by assuming that we wanted to detect this difference as statistically significant at 5% level, with a power of 80%, indicating that we needed to include 49 patients in the study (Pocock 1999). Since we expected some dropouts, and since analyses would be performed on other variables with more categories, we decided to invite 150 patients to participate in the study.

3.4 Paper II

This paper presents early experiences with MDD among different groups of health personnel in the MMC, based on four focus group interviews.

3.4.1 Participants

The selection of informants for the four focus group interviews was done strategically to catch informants who had characteristics or qualifications that were important in relation to the topics posed (Halkier 2002; Thagaard 2003). Thus, professionals from home care services (nurses), pharmacies (pharmacists) and GP practices (both GPs and GP medical secretaries), who had experienced the MDD system from different positions, were invited. This was done in order to capture as many, and as nuanced, experiences of the introduction of MDD as possible.

To the focus group of home care nurses, we invited one informant from the first eight home care units that had introduced MDD. Six nurses showed up and both MDD contacts and other nurses were represented.

Five pharmacies in Trondheim were involved in the distribution of multidose dispensed drugs. The MDD contact at each pharmacy was invited, and took part in the focus group interview. The MDD contacts were responsible for the distribution of multidose dispensed drugs, and they also provided the cooperation with the other professional groups within the MMC.

GP medical secretaries were selected on a more incidental basis, as not all GP practices had appointed a secretary responsible for MDD. Totally, six GP medical secretaries participated. These informants belonged to different practises, and it was ensured that the recruited informants had some experience in MDD.

For GPs, there was a convenient sample. Every second GP in Norway meets on a regular basis to discuss, or examine, various professional topics (Treweek et al. 2005). Participation in small groups is a requirement for maintaining their specialty as general practitioners. One such group of seven GPs participated in the interview. The informants belonged to different practices and had varying experience with MDD.

3.4.2 Design

The focus group interviews were conducted in March 2007. This was considered the early phase of the implementation. The home care nurses participating in the interview belonged to units who had started with MDD in February (3 informants) or in May (3 informants) the year before the interview.

Homogenous focus groups were made by putting together informants of the same professions. Homogeneity is recommended in order to capitalise on the shared experiences of a group (Tjora 2012).

Interview guides were developed and used by the moderator during the interview. The interview guides covered three main topics: Implementation and organizational development; Cooperation and communication; Patient safety and time use. These topics were the same for all interviews, but questions were adjusted to fit each group according to different tasks in the MMC. The interview guides were semi-structured.

3.4.3 Data analysis

Firstly, the interviews were transcribed by a master student. Next, the data material was reviewed by extracting significant statements within the text. Each author of Paper II read the transcribed interviews and made individual notes based on the different topics. During the review, different views and experiences in the focus groups, and within a specific focus group, were highlighted. When different understandings of central quotes emerged, the group had a discussion to agree on a common understanding.

Several significant issues were brought up during analysis of the data. “Trust” stood out as a theme with important concerns attached, that the authors agreed to analyse in depth. Trust is often referred to as a crucial factor, especially in collaboration (May 2006), but has seldom been thoroughly analysed in studies of implementation of complex interventions.

3.5 Paper III

Paper III presents changes in prescription routines, as well as changes in the GPs communication- and cooperation routines in the MMC.

3.5.1 Participants

All GPs in Trondheim and Tromsø were invited to participate in the study. In Trondheim (intervention), the overall number of GPs was 123 in 2005 and 137 in 2008, while in Tromsø (control), the number of GPs was 52 both years. In total, 82 (67%) and 91 (66%) filled in questionnaires in 2005 and 2008, respectively, in Trondheim. The corresponding numbers were 39 (75%) and 29 (56%) in Tromsø.

3.5.2 Design

The data was gathered through a controlled pre-post questionnaire study. Two comparisons were done. Firstly, GPs in Trondheim were compared to GPs in Tromsø (external control). Secondly, for GPs in Trondheim only, an internal control was undertaken by comparing changes in the MDD users' drugs to changes in drugs given to other patients on the GPs' lists in the home care setting.

In the pre study (accomplished fall 2005), the same questions were answered by GPs in both cities, with the exception that the Trondheim questionnaire included additional questions about the MDD system. The post study was accomplished in January 2008. In the questionnaire in Trondheim, most questions were asked twice; firstly to get information about routines related to patients in home care services with ordinary prescriptions (OP) only, and secondly to get information about routines related to patients in home care services with MDD. In Tromsø, the questions were related to patients in home care services with OP only.

GPs in Trondheim were given information about the MDD system, and the planned implementation, in mandatory meetings. The first questionnaire in Trondheim was answered by the GPs during this meeting. The second questionnaire was sent to the GPs together with an information letter. A reminder was given after three weeks. In Tromsø,

both questionnaires were handed out and collected at the GPs' offices. One reminder was given after three weeks.

3.5.3 Measures and data analyses

The GPs in Trondheim and Tromsø were asked about prescription routines, communication, and cooperation with home care services and pharmacies regarding medicines management for patients receiving home care services. In addition, the GPs in Trondheim were asked about expected effects of MDD (in the pre-study), and experienced effects of MDD (in the post-study).

The questionnaires had a multiple-choice design, including optional free-text comments.

The completed questionnaires were scanned and data was transferred to SPSS. Statistical analyses were done with SPSS. A two sample t-test was used to compare mean values, while Fisher's Exact test was used to compare the distribution of categorical variables. Logistic regression analysis was used to examine whether difference in odds of changing routines varied between intervention area and control area. Separate analyses were performed for responses that related to MDD users and patients with OP (Trondheim only).

4. Discussion of methods

4.1 The MDD project as a complex intervention

The implementation of MDD fulfils the criteria of a complex intervention (May et al. 2007). Therefore, steps outlined by the MRC guidelines (Medical Research Council 2000; Craig et al. 2008a) were chosen as a base for the design and methods used in the MDD project. Even if the guidelines (Craig et al. 2008a; Craig et al. 2008b) recommend some degree of flexibility, tailoring, and adaption to a local setting, they were hard to follow all in all.

Trondheim municipality is a large and complicated organisation that had to produce services as normal alongside the intervention. Trondheim wanted a scientific evaluation, but the needs of the patients, of the organisation, and the budget and time schedule, had priority. This put great restrictions on what the intervention could consist of, and limited the possibility of influencing the plan for the implementation. For this reason, the possibilities to undertake developmental work, or to measure allocations and risks, were also restricted.

The complexity of the MMC of MDD is shown in Figure 3-1. The formal MMC in the local MDD system involved a number of actors from various organisations, and the interacting components included both human resources and technology. Thus, to make the intervention work, an exacting implementation process was required, focusing both on the actors, and on the processes within the MMC. Firstly, it was necessary to establish a common understanding of the context for the implementation. Furthermore, knowledge about the MDD system was needed to assess the feasibility of the intervention.

4.1.1 Defining the context

To succeed in developing and evaluating complex interventions, great attention has to be paid to the context in which the intervention takes place (Craig et al. 2008b; Murray et al. 2010). Thus it was important to ensure that the MDD project group had the full picture of the setting of the intervention. There were, for example, great differences

between the different units in the home care services regarding their organisation, human resources, and types of patient; subsequently, routines in the handling of drugs were different. Knowledge about variation in the handling of drugs between the different units was important to facilitate a standardised local adoption of the MDD system. At the same time, the procedures had to allow exceptions for single units, or single patients, where the MDD system was not expected to gain the patients.

To be able to accommodate these considerations and make these decisions, a detailed knowledge about the characteristics of the intervention was needed as well; the patient's capacities had to be assessed in relation to qualities of the MDD system. One example was small letters on the plastic bags indicating that MDD was not suitable for visually impaired patients. Another example were potential problems among patients with rheumatologic conditions in opening the plastic packages of drugs. To make room for exceptions within the MDD system, the formal procedures were locally tailored. However, the responsibility for deciding if the patient was suitable for MDD or not was standardised; the patient's GP was responsible for making that assessment.

4.1.2 Assessing feasibility

Before implementing MDD in the home care services in Trondheim, the feasibility of introducing the new system had to be assessed. Even if some experiences were communicated in written reports from former local MDD implementation projects (Norli et al. 1997; Sjukehusapoteket I Skien 1999; Gombos and Norli 2000; Liavåg 2002; Kartveit and Eide 2003; Norheim and Røed 2003; Wiik and Berg 2004), lack of sound former studies of MDD made it necessary to put much effort into planning.

About 16,000 Norwegians already used multidose drugs when Trondheim introduced the system in 2006. Thus, the technology and the manufactured products were available in Norway. Further, the then current municipal procurement deal on drugs was offering delivery of multidose dispensed drugs to the home care services in Trondheim. This meant that the wanted product, multidose dispensed drugs, was available for Trondheim.

The Norwegian health authorities requested the primary health care services to implement MDD (Andrew and Rygh 2000; Helse- Og Omsorgsdepartementet 2005). To

stimulate the implementation and use, the National Health Insurance Office started to refund NOK 500 per multidose drug user in home care services, per year, from 2003 (Helse- Og Omsorgsdepartementet 2005). Still, no national guidelines were worked out for the implementation and use of MDD at the time, and every new implementation could be looked on as a new independent pilot. Altogether, the national recommendations and the economic contributions were interpreted as a promise of good feasibility.

Still it could have been local circumstances making the intervention unfeasible: Were the different actors in the MMC motivated for the intended changes? Were resources (human resources and competence) available for planning, information and teaching, working out written procedures and so on?

A study of discrepancies between medication records published prior to the MDD implementation, highlighted the safety issues related to medicines management in the home care services (Jensen et al. 2003). The study showed that the GPs had inadequate control concerning medicines management for patients in the home care services. The need for changes to improve this from a patient safety perpective were obvious.

The heightened attention on this shameful situation seemed to motivate all actors in the MMC to take action toward improving the collaborative chain. Simultaneously, the MDD system demanded a greater degree of standardisation and rigidity than earlier. Research has shown this to be hard to accept for some of the individual health personnel (Greenhalgh 2008). Also, limited resources and local prioritization could be a challenge (Frankel et al. 2003).

The greatest individualists within the different groups of health personnel in the MMC were the GPs. Even if most GPs work with other GPs, and share GP medical secretaries, the individual GPs have their own patients to follow up. Thus, the GPs are less dependent on cooperation and standardisation of their own tasks, and typically GPs show low organizational commitment (Kuusio et al. 2010). In Trondheim, however, there was one unit in the municipal administration dedicated to communicate with the GPs, and work on GP matters. The unit manager had a seat in the staff of the chief municipal executive. This made decisions taken within the MDD project group

authoritative. Since it has been shown that the first-line leaders play a key role in quality work in long-term care (Kjos et al. 2010), this might be a factor increasing the probability of success, thereby improving the feasibility of the project.

Moreover, there was a possibility that the last actors in the collaborative chain, the home care nurses, could be less motivated for change, since they were dependent on all the other groups of actors. On the other hand, the consideration that the home care nurses could also be the most motivated for change found support in the literature, which said that often, the collaborative profits are greatest for the last actor in the chain (Barimani and Hylander 2008).

Formalized procedures were established to secure standardisation of routines in the MDD system. In addition, the procedures may compensate for any missing motivation among the actors (Nylen 2007). Stavanger was among the cities already starting to use MDD, and their written procedures were used as a starting point for the local adoption in Trondheim.

4.1.3 Choosing approach and design

Deciding on evaluation methods was the next step. The MRC guidelines state that experimental designs are preferred to observational designs (Craig et al. 2008a). An individual, randomised trial at patient level was, however, not feasible. The MDD project represented an implementation of new procedures at an organisational level. In such situations, sometimes a cluster randomised design works well, but in this case, the three main collaborating partners, the home care services, the GPs, and the pharmacies represented different and crossing systems of clusters. In that case, there were two scientifically acceptable methods left that could serve the purpose; either interrupted time series or controlled pre-post studies (Wyatt and Wyatt 2003; Harris et al. 2006).

Collecting copies of medication records several times in a row for this study would place a heavy burden on busy health personnel. The collection of copies probably had to be done manually by the actors in the chain, with the risk of a gradual loss of adherence to the study. Such a procedure would also go beyond the resources available for the study. For the purpose of Paper I, it was therefore decided to do a pre-post study with an internal control (Wyatt and Wyatt 2003). Using an internal control in Paper I not only

measured the pre-post difference for drugs included in MDD, but also the pre-post difference for drugs not suitable for MDD. Both groups of medications would be subject to the same non-specified factors that might or might not influence the intervention.

The MRC guidelines also recommend a qualitative process study nested inside a complex intervention. It will often give a deeper insight into what happens, and a broader scope of the effects, including unintended effects. Thus, qualitative studies can be used to assess the quality of the implementation, eventually to clarify obstacles, and identify 'work-arounds' and possible influences of contextual factors (Lewin et al. 2009). Also, a qualitative study, based on the participants' experiences, can be used in a triangulation of the results of the intervention. However, it is most common the other way round, using quantitative research to test hypotheses brought up in qualitative research (Tjora 2012). The study published in Paper II was designed both to serve as a process evaluation, and for triangulation of results.

A pre-post design with an external control was chosen for the study in Paper III. For several reasons Tromsø was picked as most eligible for becoming a control to Trondheim. Both were university cities, and relatively large by Norwegian standards. Both cities had a fairly similar organisation of the primary care services. The collaboration between the local health authorities and the GPs had been established over years in both places. Lastly, but most importantly, Tromsø had not planned to implement MDD in the time-frame of the study.

In Paper III, separate analyses were performed for responses related to MDD users, and for patients with OP only (defined singularly for Trondheim). Thus, we obtained an internal control, enabling us to study whether possible changes in medicines management were achieved for both groups of patients (with MDD and without MDD) within the home care services.

As outlined above, we had both external and internal control represented in the pre and post studies. The comparison of GPs in Trondheim to GPs in Tromsø constituted an external control in Paper III. Internal control was used both in Paper I and Paper III. In

Paper I, the internal control was related to individual patients, whereas the internal control was related to individual GPs in Paper III.

4.1.4 The implementation process

When evaluating complex interventions it is important to focus on the *implementation process* as well as the *intervention effectiveness* (outcomes); if an intervention is not implemented effectively, positive outcomes cannot be expected (Damschroder and Hagedorn 2011).

According to the theoretical model of NPT, the intervention should be easy to describe, to provide coherence for the actors involved (Murray et al. 2010).The product, the multidose dispensed drugs, as well as the technology involved in the packaging and distribution of dispensed drugs, turned out to be quite easy to describe. The questions coming up during the implementation were mainly connected to how to solve practical tasks/problems. For example, how to handle changes in medications for MDD users.

More challenging was the shift in distribution of tasks and responsibilities among health personnel in the preparation phase of the intervention. As recommended by the NPT (May 2006), policies were prepared to minimize disputes about division of labour. In addition to preparation of local procedures, the project exploited the support that could be found in the national policies regulating tasks and responsibilities within the MMC (Helse- Og Omsorgsdepartementet 1998; Helse- Og Omsorgsdepartementet 1999; Helse- Og Omsorgsdepartementet 2000; Helse- Og Omsorgsdepartementet 2008; Helse- Og Omsorgsdepartementet 2011).

NPT further claims that the intervention should fit the overall goals and activity of the organisation, to improve collective action as well as coherence (Murray et al. 2010). The fact that the initiative to implement MDD came from the municipal management, acknowledged that the intervention was within the strategy of the organization of the home care services. Likewise, since the pharmacy management was quite pro-active in offering the MDD service, it indicated that there was a strategic commitment towards a large and important customer.

For the GPs, the strategic goal, seen from an organizational perspective, was more unclear and could become a factor inhibiting coherence and collective action in this group of actors. However, the organizational unit in the municipal administration, dedicated to communicate with the GPs, probably increased commitment to the project and stimulated collective action. In addition, the GPs were financially reimbursed for communicating patient information to the home care services and to the pharmacies. NPT says that incentives probably raised acceptance for the intervention (May 2006). Thus, the economic initiatives probably contributed to participation by GPs, despite the extra work load during the implementation of MDD.

However, extra economic resources or personnel, e.g. for training or additional work, were not given to any other groups of health personnel. The different groups of actors had to produce services as normal, along with the intervention. According to NPT, this was a risk taken that could hamper the implementation (May et al. 2007), because even if most training was organized by the MDD project group, it could be a challenge to dedicate time for training. This was a possible inhibiting factor for normalisation.

Since the responsibility for the implementation process was put on the MDD project group, modifications to the plan for implementation could be introduced during the project period if necessary, e.g. if unforeseen problems were reported.

4.2 Research in the MDD project

4.2.1 Triangulation

The logic behind triangulation is based on the premise that no single method ever adequately solves the problem of rival explanations. Because each method reveals different aspects of empirical reality, multiple methods of data collection and analysis provide more grist for the research mill (Patton 1999). To capture the many-faceted picture of a complex intervention, the guidelines, as well as literature in social science research methods, advocate use of multiple methods (Blackwood 2006; Campbell et al. 2007; Craig et al. 2008b; Tjora 2012). Our research included both method-, data source-, and observer-triangulation.

Using different methods in the three studies (Paper I-III) highlighted agreement in results (Table V in Paper III). An example is the finding that GPs achieved increased cooperation with the pharmacy concerning the patients' medications in the MDD system. This was found both in the qualitative study (Paper II) and in one of the quantitative studies (Paper III). When similar findings are seen in studies with different methodology, it strengthens the reliability and validity of the results.

Data source triangulation was achieved by collecting data from different sources (Malterud 1996). In our case focus group, interviews involving different groups of health care practitioners (nurses, pharmacists, GP medical secretaries and GPs) were accomplished. Thereby information from actors who were positioned differently in relation to the problem in question (and in the MMC) was collected. An illustrating example is the discussion of cooperation between professional groups in the MMC; both the nurses and the GPs expressed an increased level of dialogue about medications administrated "as required" during the implementation of MDD.

Observation triangulation was achieved as independent analysis of the transcribed interviews was accomplished by different researchers with various experiences (Malterud 1996). In the work with Paper II, three researchers with different experiences contributed; two of the authors had clinical experience in the field, and in addition two of the authors had experience from research on collaboration in health care. The

different experience and competence were valuable when discussing the meaning behind quotes in the material.

4.2.2 Quantitative data

Collection of data

In a pre-post study, the collection of data should preferably take place under the same conditions before and after an intervention. For controlled studies, it is also important that the data collection is done similarly both in the intervention and in the control group. In our situation, we could not follow those recommendations strictly. Collection of data had to be adapted to the local circumstances and according to the resources in the project (Craig et al. 2008b).

For the pre measurement in Paper I, the home care nurses collected the medication list from the GPs and handed them over to the study investigators together with printouts of medication lists from their own medication records. This gave the nurses an opportunity to scrutinise the lists before they were forwarded to the study investigators, but we have no signs indicating that this happened.

In the post collection of medication records, the home care units and the GPs had, at least in theory, the chance to check their records against the medication lists they routinely received from the pharmacy when changes had been made in the MDD packages. Nevertheless, we consider this an unlikely scenario.

In Paper III, the distribution and collection of data was done differently in Trondheim and in Tromsø (control). This could have biased the material, e.g. if the collection gave different opportunities for the GPs at the two sites to ask the researcher about clarification, or if members in one of the groups were in a bigger hurry when filling out the questionnaire. We cannot exclude the possibility that this occurred. All the same, the response rates were high, and similar, in both places. There are no indications that the method of distribution and collection affected the answers given by the GPs.

Timing of data collection

The timing for collection of data in Paper I and Paper III is illustrated in Figure 4-1.

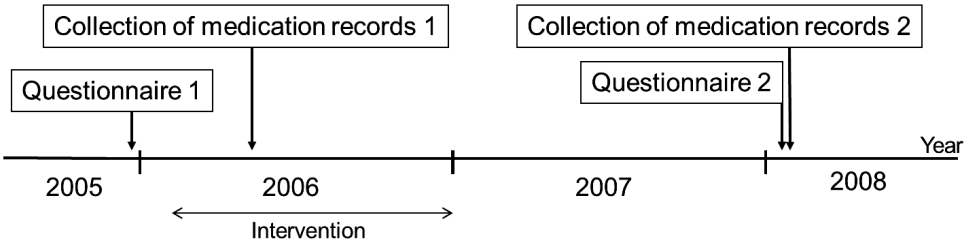

Figure 4-1: Time for collection of data in the two pre-post studies (Paper I and Paper III)

According to the early plan of Paper I, the measurements were planned to take place six months before and six months after the implementation. But because the implementation of MDD progressed more slowly than expected, the post-measurement had to be postponed to one year after implementation. This exemplifies adaptions of procedures to fit the local situation. The slow implementation might have resulted in differences in the material due to the length of multidose drug use for the individual patients. However, the start-up date for the individual patient was not registered in the study. Thus, we cannot tell whether the length of MDD use was a variable affecting the post-measurements.

The delay in collection of medication records after the implementation might also have affected the finding of numbers of discrepancies. As time passed by, changes were typically made to the medications; hence, the possibility of discrepancies increased. However, the collaborative routines were expected to improve over time and lead to better agreement between the medication records.

Furthermore, we decided to collect medication records for the post-measurements before the first annual review was performed by the pharmacies. At the time of the study, the written MDD routines stated that the pharmacies were supposed to demand an updated medication record from the patients' GPs once a year. The intention was to obtain a new prescription (valid for one year), and to make a medication reconciliation of the list of medication at the pharmacies, which forms the basis for the drug dispensing.

However, this routine was not established as intended. A new prescription was demanded only when renewal was needed due to durability. The planned medication

reconciliation would have revealed discrepancies between the medication list at the pharmacy/MDD supplier and the GP medication record, but not necessarily between the list at the pharmacy/MDD supplier and the medication record at the home care services. This latter aspect would depend on routines at the home care services during the changing of medication records when getting updates from the pharmacy. Therefore, it is difficult to tell if collection of medication records after the medication reconciliation would have given more, or less, disagreement in the post measurements. Yet since the routines changed, and the annual review was discontinued, the question becomes less relevant.

In Paper III, there was quite a long time interval between the first questionnaire and the follow-up questionnaire. Thus, some effects following the introduction of MDD might have been weakened, cancelled out, or hidden by other changes made in the MMC. This could have been avoided by performing the after-study closer to the implementation, but then would be added the risk of the findings being influenced by start-up problems. The external control group was established to assess such effects (Brown et al. 2008).

Moreover, making a series of measurements would have made the pre-post studies less dependent on good timing (Brown et al. 2008). As discussed above, this design was not possible to achieve within the resources of the project.

Possible clustering effects

Theoretically, it may be suggested that the design in Paper I could present problems because of a possible clustering of data. The patients were drawn from ten home care units, and within each unit, standardisation of internal routines may give clustering effects. However, most medication discrepancies and errors are related to the GPs' routines in managing of prescriptions, and updating of the medication records. Only a minority have, in the literature, been related to the nurses' routines (Gurwitz et al. 2003). Medication records were collected from 39 GPs in 19 different GP practices where most had one or two patients that were enrolled into the study. We reasoned, therefore, that eventual clustering effects were small and negligible.

Validity of results

The validity of a questionnaire study primarily depends on the measurements, and on good and well-formulated questions (Selltiz et al. 1976). Our questions were mainly taken from a questionnaire used by the local authorities in Trondheim (2005) less than a year before our research started. It was found feasible to use a questionnaire that had been tried before and that covered much of what we wanted.

The manager of the data collection in Tromsø (who was a pharmacist and associate professor) provided input to the questionnaire. In addition, the two physicians in the project group helped reformulate the questions to improve the language, and to make it more unambiguous. One of these physicians was responsible for the questionnaire in 2005, and reported a high level of validity of the questions in analysing the data. Since the person who originally made the questionnaire was involved in the revision, the first survey can be considered a pilot of the questionnaire.

However, minor changes in lay-out, and wording, in the questionnaires may have resulted in different interpretations among the participants (Selltiz et al. 1976). We cannot rule out that this may have influenced the reliability, and validity, of the results, but evaluating the differences included in the questionnaires, we find this of minor significance. In retrospect, we still acknowledge that the questionnaire could have benefited from a more comprehensive validation before the first data collection.

Next is the question of reliability, could we expect to get similar results doing comparable studies in other settings? In Paper I, we considered it convenient to select patients from an alphabetical list. As the selection was done by the patient's last name, there could be an increased risk of drawing family members. This may have contributed to selection bias. Making the study use once more a random selection of participants, chosen via computer generated numbers, would have been preferred.

In Paper I the dropout rate was 57%. The delay in the collection of medication records, after the implementation of MDD, probably increased the number of dropouts from deaths and people changing location. On the other hand, if the collection of medication records was done before the implementation was completed, dropouts would occur because all patients had not yet received multidose dispensed drugs. A potential

problem of a high dropout rate is that the sample size becomes too small to show statistically significant changes. Fortunately, this was not a problem in our case.

In addition, the use of controls can be questioned. In Paper I, an internal control was applied. This method is supported by others when interventions are done at the organizational level (Wyatt and Wyatt 2003). An alternative approach would have been to include a control group of patients from the same municipality, who were not subject to MDD, but the implementation process in Trondheim precluded the possibility of this.

The choice of Tromsø as a control city in Paper III seems adequate, since the two cities shared many of the same qualities. Both were large university cities in Norway, and the organization of the health care systems were comparable. Also, in Paper III an internal control was achieved at system level by asking the same question related to MDD users, and patients with OP who were in the home care services.

Access to clinical data in Paper I could have made the classification of the discrepancies more reliable (Cornish et al. 2005; Nickerson et al. 2005). Yet, the classification used in this study has also been used by others (Arora et al. 2007)

4.2.3 Qualitative data

Composition of focus groups

According to Morgan (1998), between six and 10 people normally participate in a focus group. We decided, however, to work with groups of relatively few informants. By doing this, we wanted to achieve a greater feeling of security, and gain opportunities to share personal stories and to express opinions (Morgan 1998). In this way, the participants were stimulated to become more engaged and emotionally involved with the topic. It also allowed the informants to relay their own experiences openly. Thus, in-depth knowledge was achieved (Tjora 2012).

Homogenous focus groups were composed. By forming focus groups based on professional groups, informants were "among equals", and thereby a situation was avoided where, for example, GP medical secretaries withheld information because they were anxious to offend the GPs, who supposedly possessed a higher hierarchical status. The fact that the groups were homogenous also increased the confidence of the

participants when discussing various topics (Morgan 1998). Another positive effect of having professionally homogenous focus groups was that the informants considered each other to share some fundamental background. They did not need time to explain themselves to each other, but instead spent more time discussing the topics in question (Morgan 1998).

There are also arguments in favour of bringing together a diverse group (for example, from a range of professions), to maximise the exploration of different perspectives within a group setting. In the latter case, it is important to be aware of how a hierarchy within the group may affect the data (Kitzinger 1995). In our case, the arguments for homogenous groups were stronger, and it also made the organisation of interviews simpler because some groups of actors were easier to meet in the evenings, while others preferred to meet during daytime.

Interview guides

It is important for the moderator to have an open mind and not be influenced by what the previous informants have expressed in other focus groups (Krueger 1998). This may be difficult, and one can expect various types of opinion based on what others have already said. However, people experience situations differently, and because of this, one hears statements that differ from each other, and are often contradictory. Respondents were not asked to comment on criticism raised by the others.

To ensure the quality of the interview guides, people who had experience of focus group interviews, and a good knowledge of this field of study, were consulted. Two of the supervisors of this thesis assisted in the preparation of the interview guides. Advice on seeking help with the preparation of interview guides also came from Krueger (1998), who says that regardless of how experienced a researcher is, it is not appropriate for one person alone to design questions. To ensure the quality of questions, one requires feedback from others. Open and motivating questions were important to stimulate discussion, and capture the group dynamics (Krueger 1998).

An explorative design, using a semi-structured interview guide, was chosen. The explorative approach was chosen to catch topics that the informants themselves might raise during the discussion. At the same time, structure was necessary to ensure that the

four different groups of informants discussed the same topics. Semi-structured focus group interviews are also the most common (Morgan 1998).

The interview setting

The focus group interviews were prepared and conducted in cooperation with a master's degree student. The status of the interviewer was of great concern when the focus group interviews were conducted. The master's degree student had previous experience in conducting focus group interviews, and just as importantly, she was not involved in the MDD implementation project. Therefore, she acted as a moderator in the focus group interviews. Since I was a member of the MDD project group, it was possible that this role could have influenced the informants (Wadel 1991). Thagaard (2003) writes that if the informants feel that the interviewer is authoritative or dominant, they may be inhibited from sharing experiences. In turn, significant opinions are missed. However, a moderator can never be completely neutral, no matter how hard he or she tries. Factors such as age, gender or race all play a part (Krueger 1998).

My role in the interviews was to act as an observer, make notes, and capture the group dynamics. Sometimes I asked follow-up questions, and provided information on MDD when the informants had specific questions. It is possible that my role influenced the informants, but no indications were given that this actually did happen.

The focus group interviews were carried out in the usability laboratory of the Norwegian EHR Research Centre (NSEP). We formed a triangle of tables, with the moderator at the top of the tables. The informants and the observer were seated around the tables. Cards with names were placed so that the participants could quickly find their own seat.

To create a pleasant and friendly atmosphere, coffee, fruit, and biscuits were served during the focus group interviews. Conditions such as visibility, and sound in the room were also tested for adequacy. All these things are important to the execution of the focus group interview (Morgan 1998).

In the usability laboratory at NSEP, there were cameras permanently positioned in the ceiling, and it was decided to use this equipment. Although the session was filmed, no reactions from the participants indicated that the technical equipment was bothersome.

The video recording, and the quality of the sound production from the recording equipment, facilitated the transcription of the focus group interviews.

Transcription of the interviews gave a good overview, and knowledge about the material, before starting the analysis.

Validity of results

Within qualitative methods it is appropriate to embrace the concepts of credibility, conformability and transferability (Marshall and Rossman 2006).

Credibility tells us if the research was carried out in a way that inspires confidence. E.g., if the informants had enough and relevant knowledge about MDD, and if the competence and experience within the group of researchers analysing the transcribed interviews were adequate. In Paper II, the selection of informants with adequate qualifications was safeguarded by inviting informants who had the preferred characteristics and experiences in MDD. The group of researchers possessed vital and complementary knowledge and experience in the field as well.

An aspect discussed in Paper II is the timing of the interviews in relation to the implementation process. In an early phase of implementation, engagement and optimistic attitude may dominate, while later, actors might experience problems and adopt work-arounds. Furthermore, when complex interventions are integrated into everyday practice (normalised), it might be harder to reflect upon what consequences the intervention had in the organization and for the patients. In our case, the interviews were done in the early phase. Thus, the results presented in Paper II may be more optimistic than if they'd been gathered later in the implementation process.

Conformability refers to objectivity; that is, the quality of interpretation, and if the understanding developed during this research is supported by other research (Polit and Back 2012). In our case, findings in the qualitative paper (Paper II) were in accordance with finding in the other two papers of this thesis. Furthermore, conformability is also dependent on the transferability that informs whether the interpretations based on a single study can be valid when transferred to other contexts (Polit and Back 2012). Already in Paper I, we argued that findings not only depend on MDD, but that the local procedures, and the implementation process, were of great importance to the outcome.

Similarly, in Paper II, there are reasons to believe that local circumstances did affect the findings. Therefore, generalisation of the findings must be expressed with caution.

Common problems with interviews, and with discussions in focus groups, may be that questions are misinterpreted, that people cannot remember, or that they inadvertently "embellish" their answers. These common problems may jeopardize credibility and conformability (Polit and Back 2012). However, we experienced that the informants understood the questions, and since interviews were conducted only a short time after the introduction of MDD, the chances of forgetting were unlikely. As mentioned previously, it is possible that the informants were influenced by somebody already having a good understanding of the topic being present at the interviews. This could have resulted in individual informants "embellishing" their answers in a positive frame of reference. We cannot exclude the possibility that this happened.

4.3 Ethical aspects

The studies were approved by the Regional Ethics Committee for Research in Medicine (REK), Central Norway and the Norwegian Social Science Data Services (NSD). The studies were conducted according to the Helsinki declaration (World Medical Association, 2004). All persons who were asked to participate were informed about the purpose of the studies and their right to withdrew without having to give any reason for their withdrawal.

Patients recruited in the medical record study (Paper I) received written information about the study from a nurse in the home care services, and each patient in the study was asked to sign a letter of consent, allowing the collection of medication records from the GP, home care services, and the pharmacy. The members of the expert group evaluating the discrepancies were not able to see the patient's name, as the pair of medication records was numbered, and the patients' names were redacted on the distributed copies. The data used for statistical analysis was also depersonalized.

Prior to the focus group interviews, we instructed the informants about the procedures for the interview. Video equipment was used to record both picture and sound from the focus group interviews. The groups were informed about the existence and purpose of the equipment before the interviews started. The audiotapes and transcripts were kept confidential, and all participants were de-identified in the transcription.

For the questionnaire, the GPs in Tromsø received verbal information about the study as the questionnaires were distributed. In the initial round, the GPs in Trondheim also received verbal information, while in the second round an information letter was sent out along with the questionnaire. The GPs were all informed that the responses were anonymous.

5. Synopsis of the articles

5.1 Study 1

Background: The objective of this study was to investigate whether implementation of multidose drug dispensing (MDD) for elderly outpatients is associated with a change in the number of discrepancies in the medication record at the general practitioners (GPs), and at the home care services.

Methods: We carried out a controlled pre-post study, with paired design of patients' medication records performed during implementation of MDD. Medication records from the home care units, and from the GPs, were reviewed, and the discrepancies were noted. The discrepancies were rated into four classes based upon their potential harm, and a risk score system was applied, giving the most potentially harmful discrepancies the highest score.

Results: Medication records from 59 patients, with a mean age of 80 years, were included. The number of discrepancies was reduced from 203 to 133 ($p<0.001$), and the total risk score decreased from 308 to 181 after the implementation of MDD ($p<0.001$). For both the drugs subject to MDD, and drugs not suitable for MDD, the reduction in discrepancies was significant (39% and 31% reduction respectively).

Conclusions: Calculated health risk due to discrepancies between the medication records from the home care services, and from the GPs, decreased during the time of implementation of the MDD system. It seems likely that most of the positive effect was caused by the change in routines, and enhanced focus on the medication process, rather than by MDD per se.

5.2 Study 2

Objective: To study early experiences with multidose drug dispensing (MDD) among different groups of health personnel.

Design: Qualitative study based on focus group interviews.

Setting: Primary health care, Trondheim, Norway.

Main outcome: The importance of trust in the technology, and in collaborating partners, is actualised in the early implementation of MDD.

Results: GPs, home care nurses, pharmacists, and GP medical secretaries, trusted the new MDD technology. The quality of the GPs' medication records improved. Still, health personnel, including the GPs themselves, would not always trust the medication records of the GPs. Checking the multidose bags arriving from the pharmacy was considered unnecessary in the written routines dealing with MDD. However, home care nurses experienced errors and continued to manually check the bags. Nurses in the home care services felt a loss of knowledge with respect to the patients' medications. In turn, they experienced a reduced ability to give medical information to patients, and to observe the effects of the drugs. The home care services' routines for medicines management were not always trusted by the other groups of health personnel involved.

Conclusion: Health personnel faced some challenges during the implementation of the MDD system, but most of them remained confident in the new system. Building trust has to be a process that runs in parallel with the introduction of new technology, and the establishment of new routines for improving the quality in management of medicines, so to facilitate better cooperation and communication.

5.3 Study 3

Background: This study addresses GPs' attitudes towards multidose drug dispensing before, and after, implementation, and their perceived experience of how multidose drug dispensing affects prescription and communication routines for patients in the home care services. This study contributes to a method triangulation with two other studies on the introduction of multidose drug dispensing in Trondheim.

Methods: A controlled pre-post study carried out in Trondheim (intervention) and Tromsø (control). A questionnaire was distributed to all GPs in the two towns in 2005, with a follow-up questionnaire in 2008.

Results: The GPs in Trondheim showed a positive attitude to multidose drug dispensing both before, and after, the implementation. Increased workload was reported, but still the GPs wanted the system to be continued. Most of the GPs reported a better overview of the patients' medication, and a supposed reduction in medication errors. The GPs' prescription- and communication routines were changed only for the multidose drug users, and not for the other patients in the home care services.

Conclusions: The study supports the results presented in two previous publications, related to GPs' positive attitude towards multidose drug dispensing, their better overview of the patients' medications, and improved cooperation with the pharmacy. This study adds to our understanding of prescription routines among GPs, and the use of the medication module in the electronic health record.

6. Discussion of findings

6.1 Perceived patient safety within the MDD system

Improved quality in medicines management, and thereby increased medication safety, was a goal for all the actors involved in the introduction of MDD (Paper II). This engagement supported the implementation so that the MDD could be established as a regular practice (normalization) (Murray et al. 2010).

An important issue related to medication safety, is whether the medications given to the patients are the same as those prescribed by the patients' doctors. In the focus group interviews during the early phase of the implementation of MDD, informants had a common expectation that the intervention would reduce the number of discrepancies between medication records (Paper II). Their expectations were later confirmed when comparing medication records from the GPs, and from the home care services (Paper I). However, the same has not been demonstrated by other, similar, studies (Bakken and Straand 2003; Heier et al. 2007). Even if Paper I showed a reduction in discrepancies, it also demonstrated a great potential for further improvements to get more synchronized medication records.

Improved agreement between the medication records could be the result of various factors. The establishment of common and well-known routines, before the start up with MDD, was suggested to be central to clarifying how, and to whom, different information should be addressed (Paper I-III). For the future, sharing of a common medication record is a solution already launched to avert discrepancies (Heimly 2008), but effects on medication safety are not revealed.

Complexity may inhibit trust (Luhmann 1979), and trust is claimed to be the "glue" in interactive processes (May 2006). Both trust and power are generated at the inter-personal level, and both play a critical role in shaping the quality of relations between organizations (Bachmann 2001). Thus, reduction of complexity improves the possibilities for the cooperative action that depends on trust (Luhmann 1979). The restriction imposed in Trondheim by only allowing the patients' GPs to prescribe drugs

for inclusion in the multidose packages, was an example of how complexity in the MMC was reduced, and they thus eased the implementation process (Paper II and III).

In addition, when implementing MDD, trust in the new technology was an important issue (Paper II). Technology-mediated trust is claimed to depend on the changing of human attitudes and behaviour (Rosenbloom 2000). The NPT also claims that the implementation of a complex intervention depends on collective action (Murray et al. 2010). Thus, if the new technology creates a need for extra training, or big changes in work practices, the new technology may inhibit the implementation. Our findings, presented in Paper II, indicated that the health personnel involved trusted the technology used in MDD. Indeed, in order to safeguard information about the patients' drug prescriptions, technology was necessary, and a lack of technology (e.g. ePrescribing) seemed to be a problem in the MMC, and became even more visible within the MDD system (Paper II).

Moreover, findings presented in Paper II and III imply that implementing MDD was thought to be a good idea among the different healthcare professionals, and they found it worth investing time, energy and work. Thus, the cognitive participation among the actors was found to be satisfactory. According to NPT, this probably increased the possibilities of achieving normalisation (Murray et al. 2010).

6.2 Obstacles within the MDD system

Despite perceived safety within the MDD system, some obstacles and 'work-arounds' were reported (Paper II).

When an intervention presents practical obstacles, or elements of the intervention are considered unnecessary, or not meaningful, in order to complete the work, actors will redesign the work process to minimize the obstacles (Ash et al. 2004; Halbesleben et al. 2008). In the present intervention, the plastic bags with drugs were difficult to open for some patients, thus they needed extra help. Transferring the tablets from the plastic bags into e.g. egg cups before intake represents a risk, but also a way to overcome an obstacle. Such 'work-arounds' may lessen the reliability of the work processes, with the result being reduced patient safety (Halbesleben et al. 2008).

Further, it was reported that a loss of flexibility in prescriptions of drugs when implementing the MDD system, e.g. an interim change in dosage, was considered problematic in the MDD system (Paper II). For most patients, some drugs (like eye drops and inhalers, as well as drugs not taken regularly) had to be maintained manually in parallel with the multidose dispensed drugs, and for others only OP was suitable. This was an indication that the MDD system was not complete, and the old system (OP) had to be maintained together with the new system (MDD) to ensure the medications for all the patients in need of assistance from the home care services. Thus, additional use of OP was a way to work around an imperfect MDD system.

In our study of medication records, 70% of all medications were found suitable for MDD (269 of 386 drugs before, and 298 of 424 drugs after the implementation of MDD - results not previously published). In contrast, a Swedish study reported that half of the drugs prescribed within the MDD system were delivered in whole packages (Wallerstedt et al. 2013). This may be caused by an insufficient flexibility of the Swedish system. However, the findings in our material and the Swedish study are not directly comparable; the numbers in our data of medication records came from categorisation of medication by formulation (e.g. tablets, eye drops, and inhalers) or dosage (regularly or when needed), while the numbers presented in the Swedish study were register-based (Swedish Prescribed Drug Register).

The MMC within the MDD system is drawn in Figure 3-1. Although MDD systems have been called automation of the MMC, Figure 3-1 shows that there are still manual processes within the chain. The patient's medication list is recorded several times during the process, and manual work still causes a risk of translation errors during the different steps of the process. In addition, there will always be a risk of adverse drug events because of errors in the communications between actors involved in the MDD, or when patients are transferred between various health care settings (Chhabra et al. 2012; Midlov et al. 2012). Therefore, automation in the updating of information between actors has been called for (Heimly 2008). On the other hand, it has been emphasized that automation processes in the handling of drugs may threaten the quality of many (hidden) manual work procedures (Hamre et al. 2010).

The system of electronic prescriptions has gradually been introduced in Norway. From the beginning of 2013, ePrescription was in use across the country. Even if MDD patients constitute more than 50,000 of the heaviest users of medicines in Norway, the functionality for multidose drug prescription is not yet in place in the ePrescription system. It will be included in a later version (pers. com. Ole Martin Winnem). In Sweden, a national electronic MDD database is well established. This MDD database has been located outside the physicians' EHR, forcing the physicians responsible to document changes in dual systems. Thus, there is a risk of transcribing errors, or the omission of updated prescription information in one of the systems (Midlov et al. 2012).

Focusing on the MMC drawn in Figure 3-1, the Swedish prescription model would remove the manual punching of data done at the pharmacy. Instead, punching must be done twice by the GPs. According to recent scientific results from Sweden, the solution for prescription within the MDD system should be integrated in the physician's EHR (Sjoberg et al. 2011; Midlov et al. 2012; Sjoberg et al. 2012).

As prescription turns electronic, the handover and access to the prescriptions will be simplified. However, the introduction of electronic systems are not unproblematic, and new problems or sources of error can occur (Bell et al. 2004; Koppel 2005; Grimsmo 2006). To conclude, even if technology may contribute to improved patient safety, the systems are only as good as their users (Hidle 2007). Thus, technology can never fully replace human resources, and there will always be a need to improvise and develop 'work-arounds'.

6.3 Cooperation among actors in the MMC

All groups of health professionals in the MMC shared a concern about medication safety throughout the whole chain (Paper II). Their contributions may be seen as a collective action, which is one of four main components making an intervention become normalised according to the theoretical model of NPT (Murray et al. 2010).

The actors especially were concerned about improved routines for the updating of medication records, to avoid inconsistency between themselves. We found that the intervention positively affected cooperation between the different groups of health personnel (Paper II and III), despite the fact that the actors experienced the changes to

be more challenging than expected beforehand (Paper III). MDD demanded more cooperation, as well as raising the general workload in the prescription phase compared to OP.

6.4 Changes in roles, routines and responsibility

Since the introduction of MDD resulted in changes to both tasks, and distribution of tasks, as well as responsibilities in the MMC, it could inhibit the embedding of the interventions into normalised routines of health care practice (May et al. 2007). Considerations about how the different groups of health personnel are affected by the intervention, if it promotes or impedes their work, and how compatible it is with existing work practices, are of the utmost importance to succeed with normalisation (Murray et al. 2010).

In Paper II, we found that the nurses were uncomfortable with losing tasks, because they feared that their competency in medications, and knowledge about the individual patients' drug use, would be reduced. Before the MDD system was implemented, the home care services had a hand in almost every stage in the MCC. They sent a request to the GP when renewal of prescriptions were needed, they ordered medication from the pharmacy, they delivered medication dosages in accordance with the medication list recorded in their own EHR, and in the end they assisted the patients by administering the drugs. When tasks were lost during the implementation of MDD, some of the hidden manual work also disappeared, and thus the sense of control was reduced (Paper II). When the nurses expressed a frustration over loss of control, it was evidence of a feeling of responsibility for the patient's safety. One way of retaining control was to check the MDD packages when they arrived from the pharmacy. Findings in Paper II were recently supported by a Norwegian questionnaire study among nurses working in nursing homes. The nurses reported that MDD led to a loss of knowledge (79.5%), control (72.4%), and overview (72.4%) of the patients' medications (Nilsen and Sagmo 2012).

For the other two groups of actors (the GPs and the pharmacists), changes in routines seemed to provide better system support for focusing on the complete medication list rather than just single prescriptions (Paper II and III). We found that the pharmacy

became an important communication partner within the MDD system (Paper II and III). This finding has also been reported by others (Berntsen and Hamre 2009).

Further, improved prescription routines were reported by the GPs (Paper II and III). The change in prescription ratio made through the EHR medication module (Paper I), also indicated that the intervention affected the GPs' prescriptions routines. However, the improved prescribing routines for the MDD patients were not transferred by the GPs to their other patients in the home care services (Paper III). For example, GPs consulted the EHR more often when prescribing to patients enrolled in the MDD system than other patients in the home care services. This implies that the introduction of MDD forced the GPs to assume greater responsibility for the medication of their patients (Paper II and III). Our findings support studies demonstrating a negative correlation between the quality of prescribing and the number of prescribers per patient (Bedell et al. 2000; Green et al. 2007; Olsson et al. 2010).

Generally, formalisation of the changes was identified as an important success factor in the implementation of the MDD system (Paper II). This finding has been supported by others studying MDD (Heier et al. 2007; Kunnskapssenteret 2009).

7. Conclusion

The present research was conducted to gain an insight into effects of the introduction of MDD in Trondheim, and how the different groups of health professionals welcomed the intervention. The implementation involved a number of actors from various organisations, and the interacting components included both human resources (mostly local), and technology (nationally available).

The work has provided new knowledge about the MDD system applied in a home care setting. The results presented give an indication that the MDD system improved the quality in the management of medicines for the multidose drug users. However, changes did not seem to transfer to the patients in the home care services with OP.

The process of implementation of MDD in Trondheim was associated with a reduction in discrepancies between medication records of the GPs and the home care services. Both the number of discrepancies, and the potential of the discrepancies to cause harm, were reduced. The reduction in discrepancies was significant both for dispensed drugs, and drugs not suitable for the automatic packaging system (drugs used only when needed, and drugs with unsuitable formulations, e.g. eye drops and inhalers).

Improved quality in the MMC did not only appear by replacing traditional drug dispensers with multidose drug packages. The main contributions to improved safety were emphasizing the processes within the MMC, improvement of communication and cooperation between actors, and clarification of roles and responsibilities. Improving the procedures before implementing MDD is probably more important for proper medicines management, than the transition from manual to automatic dispensing.

Changes in routines and roles required a higher level of trust between the groups of professionals. The different groups of actors involved in the MMC for patients in the home care services trusted the MDD system. However, trust was challenged by medication records being out-of-date, and by the loss of flexibility.

The GPs showed a positive attitude to the MDD system, both before, and after the implementation of the system. Increased workloads were reported, but still the GPs wanted the system to be continued. Most GPs reported a better overview of their patients' drugs, and a reduction in the number of medication errors. The GPs

prescription and communication routines were changed for the multidose drug users, but not for the other patients in the home care services. Restricting the right to prescribe multidose dispensed drugs to the GPs made the GPs take on a greater responsibility for their patients' medications, and made the MMC within the MDD system less complex.

Furthermore, common to all complex interventions is the importance of the setting in which the intervention is done. Because the setting will vary from place to place, the challenges of implementing MDD will vary as well. This means that the findings in evaluations of different interventions cannot be generalized straight forwardly. However, the insights from the studies presented in this thesis should though be valid for others planning to implement an MDD system, or already using MDD in the home care services.

8. Further research recommendations

In this work, scant attention was paid to the patients – the multidose drug users. Nor is there much evidence published in the literature about how patients experience MDD. However, a Danish study, based on nine patient interviews, claims that the positive implications of switching to MDD, as assumed by health professionals and legislators before the implementations, did not occur among users (Larsen and Haugbolle 2007). Unfortunately, medication users are rarely a part of the health policy decision making process (Coulter 2004; Traulsen and Almarsdottir 2005), or involved in the development and assessment of new health technologies (Hansen 1992; Coulter 2004). This lack of user involvement also appears to apply to MDD (Larsen and Haugbolle 2007). What consequences this may have are still unknown.

It has been demonstrated that older patients know less about their medications and illnesses than younger patients (Granas and Bates 2005). Swedish studies on elderly patients show that the healthcare consumption pattern of those with less knowledge was different to those with more knowledge in terms of more acute inpatient care (Kristensson et al. 2010). Additionally, patients with polypharmacy had significantly less knowledge about their medicines than patients with fewer drugs (Modig et al. 2009). It has also been claimed that adherence is related to the patients' knowledge of, and attitude towards, medicines (Griffith 1990; Horne and Weinman 1999; Okuno et al. 1999; Barat et al. 2001; Burge et al. 2005; Clifford et al. 2008; Menckeberg et al. 2008). When it comes to association between knowledge and adherence among MDD users, findings are contradictory; a study among 119 MDD users, and 96 patient with OP, performed in the Netherlands, shows that older patients using MDD had better medication adherence, but poorer medication knowledge, compared to patients with OP (Kwint et al. 2013). Yet a study from Sweden among 39 elderly patients did not show the same differences (Modig et al. 2009). Therefore, additional data on this concern is needed.

The nursing role has previously been described as the last defence in a safety net to prevent errors (Leape et al. 1995). In Paper II, nurses reported that less attention was paid to medications after the introduction of MDD. Instead, the pharmacy was

highlighted as a new safety net. More research is necessary to examine the consequences of this potential change in responsibility both within and between the actors.

To provide the pharmacist with more opportunity for control, better continuity in the follow-up of patients, and greater opportunities for professional intervention, are listed among the arguments for implementing MDD. In what ways do the pharmacy staff actually contribute to improving medication safety? Through detection of drug interactions, or better management of the patients' medications in the MDD system? A randomised controlled study in the Netherlands reported that pharmacist-led medication review improved medication use among MDD users. Medication reviews by pharmacists are recommended, or provided, in Australia and Finland as well (Bell et al. 2007; Australian Government Department of Veterans' Affaires 2012). However, evidence for this argument seems to be missing.

The patients in the home care services are primarily elderly and sick people that circulate between health care-providers. Thus, when the patient receives multidose dispensed drugs, health personnel outside the primary care must also act in accordance with the MDD system. Studies looking at how health professionals in secondary care experience the MDD system are few and far between. However, a published paper concluded that when elderly patients are transferred from hospital to community/primary care, the main risk factor seems to be MDD, or rather the process of how to use it (Midlov et al. 2012). Interestingly, when the system was supported by clinical pharmacists, the error rate dropped to the same level as for patients with OP. More research is needed to learn how to best handle the MDD patient when moving between levels of care.

When developing new technology, it is important to know about the existing technologies and processes. It is vital not to forget about hidden manual work, and the unspoken roles of health personnel in the former workflow. Thus, automation should be based on knowledge about which processes are important to maintain safe management of medication in the manual system. Workflow studies will make a good contribution to the results presented in this thesis, and will be helpful in providing a more differentiated description of the MDD system, and how it works in practice. Furthermore, workflow

studies might be helpful in providing insight into how to improve the existing MDD systems, and what one must be aware of when prescription of multidose drugs is included in the Norwegian ePrescribing.

As prescription of multidose drugs turns electronic, knowledge about consequences of the new functionalities are demanded. E.g., the restriction made in Trondheim of allowing only the GPs to prescribe multidose drugs will cease. As discussed earlier, introduction of electronic systems are not unproblematic, and new problems and new sources of errors may occur (Bell et al. 2004; Koppel 2005; Grimsmo 2006).

9. References

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10. Appendix

Appendix Paper I

Samtykkeskjema
Informasjonsbrev

Appendix Paper II

Samtaleguide apotek
Samtaleguide fastleger
Samtaleguide hjemmetjeneste
Samtaleguide legesekretærer

Appendix Paper III

Spørreskjema Tromsø 2005
Spørreskjema Trondheim 2005
Spørreskjema Tromsø 2008
Spørreskjema Trondheim 2008

Paper I

Paper II

Paper III

Appendix Paper I

NTNU

TRONDHEIM KOMMUNE

SAMTYKKESKJEMA

for deltagelse i studien "Forebygging av utilsiktede hendelser med legemidler hos pasienter i hjemmetjenesten- Innføring av multidosepakkede legemidler og utvikling og utprøving av samtykkebasert elektronisk medisinkort i Trondheim"

Jeg har mottatt informasjon om innføringen av nytt doseringssystem og ny løsning som gjør at hjemmetjenesten får tilgang til fastlegens medisininformasjon ved bruk av moderne datateknologi. Jeg er også informert om studien som skal vurdere nytten av nye rutiner og metoder for samhandling omkring medisineringen til brukere av hjemmetjenesten.

Jeg gir herved mitt samtykke til å delta i studien, og at opplysninger i medisinliste fra hjemmetjenesten, fastlege og apotek blir benyttet til å vurdere kvaliteten av de nye tiltakene i kommunen.

Trondheim,

_____

pasientens underskrift

NB: Samtykket sendes kommuneoverlege Helge Garåsen. Kopi legges i pasientjournal hos hjemmesykepleien.

NTNU

TRONDHEIM KOMMUNE

Til deg som mottar hjelp av hjemmetjenesten med dosering av medisiner

Informasjon og forespørsel om å delta i en studie som skal vurdere nytten av en ny måte å dosere medisinene dine på og for å få til en bedre samhandling mellom hjemmetjenesten og din fastlege

Riktig medisin til riktig pasient er en meget viktig oppgave i den kommunale helsetjenesten. Oppgaven er tidkrevende for personalet og krever en stor grad av opplæring og oppfølging.

Trondheim kommune jobber aktivt for å sikre at du som bruker av hjemmetjenesten skal få riktig medisin til riktig tid. To tiltak er nå satt i gang for å gjøre dette enda bedre:

1) Innføring av ferdigpakkete doser av medisiner fra apoteket
   Den tradisjonelle ukedosetten skal erstattes med dosepakker (multidoser) fra apoteket. Undersøkelser viser at dette reduserer mulighetene for feil vesentlig.
2) Utvikling og utprøving av elektroniske medisinkort
   Kommunen vil prøve ut en ny løsning som gjør at hjemmetjenesten får tilgang til fastlegens medisininformasjon ved bruk av moderne datateknologi. Dette vil sikre at hjemmesykepleien og din fastlege alltid har de samme opplysningene om dine medisiner.

Vi ønsker å finne ut om disse tiltakene gir en sikre legemiddelhåndteringen for deg og andre brukere av hjemmetjenesten. Vi vil gjerne se på om medisinopplyningene hos fastlegen, i hjemmetjenesten og på apotek samsvarer bedre etter at vi tar i bruk våre nye rutiner.

Vi ber derfor om at du samtykker i at vi i evalueringen av prosjektene får tilgang til opplysninger omkring dine medisiner hos hjemmetjenesten, hos fastlegen og på apoteket slik at vi kan sammenligne om alle har den samme og korrekte informasjonen om dine medisiner. All informasjon om dine medisiner vil bli brukt slik at det ikke vil bli mulig å spore noen opplysninger tilbake til deg som person. Når undersøkelsen er ferdig i år 2012, vil vi tilintetgjøre alle personidentifiserbare opplysninger som vi har samlet inn.

Prosjektmedarbeidere har taushetsplikt i hht. Forvaltningsloven § 13 og Helsepersonelloven § 21. Alle persondata behandles konfidensielt og lagres i en database slik at pasientene er registrert med et løpenummer. Undersøkelsesresultat samt navneliste, hvor slike eksisterer, oppbevares forskriftsmessig.

Deltagelse i studien er frivillig, og du kan når som helst trekke deg fra deltagelse i studien uten at du behøver å angi noen grunn. Dette vil ikke medføre noen konsekvenser for deg som bruker av hjemmetjenesten.

Vi håper at du synes dette er en nyttig undersøkelse og sier ja til at vi kan innhente informasjon om dine medisiner hos din fastlege, hos hjemmesykepleien og på apoteket.

Prosjektet er vurdert og godkjent av Regional komité for medisinsk forskningsetikk, Midt Norge og er tilrådd av Personvernombudet for forskning, Norsk samfunnsvitenskaplige datatjeneste.

Du kan stille flere spørsmål til personalet i hjemmetjenesten eller til kommuneoverlege Helge Garåsen på telefon 91112656.

Trondheim, 10.03.2006

Liv Johanne Sætern
Farmasøyt/stipendiat
NTNU

Helge Garåsen
Kommuneoverlege
Trondheim kommune

Appendix Paper II

SAMTALEGUIDE APOTEK 12.mars 2007

Introduksjon ved Marte

- Hva er et fokusgruppeintervju
- Om gjennomføringen

Implementering og organisasjonsutvikling

Først i samtalen med dere vil vi få rede på hva dere synes om multidose og hvordan ekspedering av multidose har innvirket på deres arbeidssituasjon.

1. Hva er deres erfaring med oppstarten av multidose? (godt/ikke godt) Er det ulike erfaringer fra de ulike apotek?

a) Hva synes dere om informasjonen og opplæringen dere fikk i forkant? Hva besto dette i? Har alle ansatte fått opplæring i håndtering av multidose?
b) To apotek, Heimdal og Saupstad, startet opp med multidose før de andre. Hvordan fungerte erfaringsoverføringen fra et apotek til det andre?
c) Hvor godt kjent er du med de skriftlige prosedyrene til Trondheim kommune som omhandler multidose?
d) Hvilke andre skriftlige prosedyrer har dere på apoteket som omhandler multidose (egne, fra Farmaka ea.). (Følges disse?)

2. Multidose var nytt for apoteket og sikkert for de fleste ansatte. Dere fikk en mengde nye kunder og oppgaver i løpet av en relativt kort periode. Hvilken innvirkning har dette på arbeidefordelingen på apoteket?

a) Multidoseansvarlig sin rolle? (Er dette en rolle som vil bli opprettholdt eller er det naturlig at den forsvinner når multidose er ”oppe og går”?)
b) Da andre farmasøytene sin rolle?
c) Teknikerne sin rolle?
d) Apotekeren sin rolle?
e) Hva med ledelsen i Alliance apotekene lokalt?

Samarbeid og kommunikasjon

Kommunikasjon og samarbeid har mye å si for hvor suksessfull informasjonsoverføringen er. Nå skal vi gå inn på tema om bruk av Farmapro og Farmaka sin programvare for overføring av informasjon. Vi vil også høre om samarbeidet mellom de ulike partene (hjemmesykepleie, apotek og fastlegene) som berøres av multidose.

3. Vi starter med å diskutere samarbeid og kommunikasjon omkring multidose.
    a) Hvordan er informasjonsflyten internt på apoteket?
    b) Hvordan er informasjonsflyten apotekene imellom?
    c) Hvordan er informasjonsflyten mellom dere og hjemmesykepleien? Oppleves store forskjeller mellom sonene?
    d) Hvordan er informasjonsflyten mellom dere og fastlegene? Også her er vi interesserte i å høre om dere opplever store forskjeller mellom leger/legekontor og hvordan det evt håndteres?
    e) Hvordan er informasjonsflyten mellom dere og Farmaka?
    f) Får du all informasjon du trenger?
    g) Får du gitt all nødvendig informasjon?
    h) Hva med kommunikasjonen kan forbedres?

Sikkerhet og tidsbruk

Nå, som siste tema skal vi snakke om sikkerheten rundt multidose. Multidose ble innført for å bedre kvalitet i legemiddelhåndteringen og for å frigjøre sykepleiertid til andre oppgaver.

4. Først her skal vi ta utgangspunkt i bedring av kvalitet i legemiddelhåndteringen.
    a) Hvordan føler dere at dere som farmasøyter bidrar til økt sikkerhet og kvalitet? Er bidraget blitt endret etter at multidose ble innført? Hvorfor/hvorfor ikke?

b) Hvilke feil har tidligere vært mest vanlig i forbindelse med ekspedering av legemidler til hjemmetjenesten?
    i. Har sjansen for å gjøre noen av disse feilene blitt redusert/forsvunnet?
    ii. Har dere oppdaget nye muligheter for feil som kommer av multidosesystemet. Har dere eksempler på dette?
c) Har dere fått reaksjoner fra pasientene eller pårørende på multidose? (betaling, fleksibilitet, service?)
d) Hvordan er overensstemmelsen mellom ordinasjonskortet på apoteket og medisinlistene til fastlegene?
e) Noen pasienter skal ha noe medisin som ikke multidosesystemet tar seg av (eventuellmedisin og faste legemidler som ikke kan pakkes i multidose). Hvordan fungerer utleveringen av disse legemidlene?

5. Hvordan foregår oppdateringen av ordinasjonskortet?
    i. Hvem gjør denne oppgaven?
    ii. Når blir denne oppgaven gjort? (kun når resept foreligger fra lege eller også når endringer blir meldt fra andre forskrivere eller fra hjemmetjenesten?)
    iii. Blir endringer som skrives inn i ordinasjonskortet kontrollert av en annen farmasøyt eller tekniker?
    iv. Føler dere dere trygge på at ordinasjonskortet til enhver tid er oppdatert?

6. Nå skal vi diskutere hvordan multidose innvirker på deres tidsbruk.
    a) I hvilken grad er ressursene på apoteket justert i forhold til påført arbeidsmengde med multidose? Har de nye oppgavene gitt:
        i. Endret bemanning?
        ii. Endret tid til andre oppgaver? I så fall hvilke?
        iii. Overtid?
    b) Har leveranse av multidose ført til at hjemmetjenesten etterspør andre tjenester?
        i. Gjennomgang av medisineringen til enkeltpasienter
        ii. Vurderinger av effekter, bivirkninger, kontraindikasjoner og interaksjoner

iii. Pasientinformasjon/opplæring
iv. Andre farmasøytiske tjenester? (undervisning, skriftlig informasjon, synonymliste…)

c) Har leveranse av multidose ført til at fastlegene etterspør andre tjenester enn tidligere?
   i. Gjennomgang av medisineringen til enkeltpasienter
   ii. Vurderinger av effekter, bivirkninger, kontraindikasjoner og interaksjoner
   iii. Pasientinformasjon/opplæring
   iv. Andre farmasøytiske tjenester?
d) Har den nye ordningen påvirket hvilken informasjon dere gir til pasientene om legemidler?

Oppsummering

Er dere fornøyde eller misfornøyde med at apoteket har begynt å levere multidose til hjemmesykepleien?
Noe å tilføye?

Takk☺

SAMTALEGUIDE FASTLEGER 26.mars 2007

Introduksjon ved Liv Johanne

- Hva er et fokusgruppeintervju
- Om gjennomføringen

Implementering og organisasjonsutvikling

Først i samtalen med dere vil vi høre hva dere synes om multidose og om dette har hatt noen innvirkning på deres daglige arbeide.

1. Hvordan har innføringen av multidose gått?
    a) Hva er deres erfaring med innføringen av multidose? (godt/ikke godt)
    b) Hva synes dere om informasjonen dere fikk i forkant? Hva besto denne i?
    c) Er du godt kjent med de skriftlige prosedyrene til Trondheim kommune som omhandler multidose? Hva med hjemmesiden til Trondheim kommune som omhandler multiodoseprosjektet?

2. Har multidose endret på fordeling av arbeidsoppgavene internt på legesenteret i forhold til oppfølging av pasientene som mottar hjemmesykepleie?
    a) Legesekretærenes oppgaver
    b) Dine oppgaver

Bruk av EPJ og kommunikasjon

Kommunikasjon og samarbeid har mye å si for hvor suksessfull informasjonsoverføringen er. Det er viktig at dere kommuniserer og samarbeider godt med hjemmesykepleiere og apotek for at pasienten skal få riktig medisin.

3. Nå skal vi gå inn på tema om bruk av EPJ, og høre litt fra dere om samarbeidet mellom de ulike partene (hjemmesykepleie, apotek, legesekretærer og dere).
    a) Hvordan er informasjonsflyten mellom dere og hjemmesykepleien?
    b) Hvordan er informasjonsflyten mellom dere og apotekene?
    c) Hvordan er informasjonsflyten (samarbeidet) mellom dere og legesekretærene?

d) Får du all informasjon du trenger?
e) Får du gitt all nødvendig informasjon?
f) Hva med kommunikasjonen kan forbedres?

4. Hvordan brukes EPJ i kommunikasjonen?

a) Dokumenteres legemiddelrelatert informasjon i lik grad nå som før i EPJ?
b) Hvordan påvirker multidose bruken av medisinlisten i EPJ?
c) Oppdaterer dere medisinlisten på samme måte som før? (hvorfor/hvorfor ikke?)
d) Har det endret seg hvor ofte og hvem som gjør oppgaven?
e) Studere dere medisinkortet i samme grad som før?
f) Har multidose ført til at andre deler (enn medisinlisten) av EPJ blir brukt mer eller mindre enn før?

5. Hva er synet deres på dagens EPJ og hvordan synes dere at de/den fungerer? (i forhold til oversikt over pasientinformasjon og oppdatering?)

Sikkerhet og tidsbruk

Nå, som siste tema skal vi snakke om sikkerheten rundt multidose. Multidose ble innført for å bedre kvalitet i legemiddelhåndteringen og for å frigjøre sykepleiertid til andre oppgaver.

6. Hvordan mener dere bruken av multidose påvirker sikkerheten for pasientene i forhold til medisinering?

a) Har bidraget fra legene i forhold til sikkerhet blitt endret som følge av multidose? På hvilken måte?
b) Hvilke feil har tidligere vært mest vanlig i forbindelse med medisinering?
c) Har sjansen for å gjøre noen av disse feilene blitt redusert/forsvunnet?
d) Har dere oppdaget nye muligheter for feil som kommer av det nye multidose systemet. Har dere eksempler på dette?
e) Hvordan håndterer dere at noen pasienter skal ha noe medisin som ikke multidosesystemet tar seg av? Er dette blitt endret etter at multidose ble innført?

7. Hvordan foregår oppdateringen av medisinlistene?
    a) Hvem gjør denne oppgaven?
    b) Når blir denne oppgaven gjort? (ved konsultasjoner, telefonkontakt om endringer fra hjemmesykepleien, apotek, sykehus, sykehjem eller andre, ved årskontroll…)
    c) Føler dere dere trygge på at medisinlistene til enhver tid er oppdatert?

8. Pasient- og pårørende- kontakt
    a) Har dere fått reaksjoner fra pasientene eller pårørende på multidose?
    b) Har den nye ordningen påvirket hvilken informasjon dere gir til pasientene om legemidler?

9. Hvilke tanker har dere om videreføringen av multidose?

Oppsummering
Er dere fornøyde eller misfornøyde med at Trondheim kommune har tatt i bruk multidose?
Noe å tilføye?
Takk☺

SAMTALEGUIDE HJEMMESYKEPLEIEN 6.mars 2007

Introduksjon ved Marte

- Hva er et fokusgruppeintervju
- Om gjennomføringen

Implementering og organisasjonsutvikling

Først i samtalen med dere vil få rede på hva dere synes om multidose og om dette har hatt noen innvirkning i deres arbeid.

1. Hvordan har innføringen av multidose gått?
    a) Hva er deres erfaring med innføringen av multidose? (godt/ikke godt)
    b) Hva synes dere om informasjonen dere fikk i forkant?
    c) Var du godt kjent med de skriftlige prosedyrene?

2. Legemiddelhåndtering er i utgangspunktet en sykepleier og vernepleier oppgave. Har innføringen av multidose endret på fordelingen av oppgaver i håndteringen av legemidler?
    a) Multidoseansvarlig sin rolle? Er dette en rolle som vil bli opprettholdt eller er det naturlig at den forsvinner når multidose er "oppe og går"?
    b) Da andre sykepleiernes sin rolle?
    c) Hjelpepleiere og omsorgsarbeidere med delegering sin rolle?
    d) Ufaglærte sin rolle?
    e) Enhetsleders innstilling til arbeidet med innføring av multidose?

Bruk av Gerica og kommunikasjon

Kommunikasjon og samarbeid har mye å si for hvor suksessfull informasjonsoverføringen er. Nå skal vi gå inn på tema om bruk av Gerica og høre litt fra dere om samarbeidet mellom de ulike partene (hjemmesykepleie, apotek og fastlegene) som berøres av multidose.

3. Hvordan fungerer samarbeidet med dere, apotek og fastleger?

a) Hvordan er informasjonsflyten dere i mellom?
b) Hvordan brukes Gerica i kommunikasjonen?
c) Får du all informasjon du trenger?
d) Får du gitt all nødvendig informasjon?
e) Dokumenteres legemiddelrelatert informasjon i lik grad nå som før i Gerica?
f) Hva med kommunikasjonen kan forbedres?

4. Hvordan påvirker multidose bruken av medisinkortet i Gerica?

a) Oppdaterer dere medisinkortet på samme måte som før – hvorfor/hvorfor ikke?
    i. Har det endret seg hvor ofte og hvem som gjør oppgaven?
    ii. Studere dere medisinkortet like ofte som før?
    iii. Kunne oppgaven nå vært gitt til andre - kontorpersonell?
    iv. Har endret bruk av medisinkortet ført til at andre deler av Gerica blir brukt mer eller mindre enn før?

5. Hvilken bruk og nytte har hjemmejournalen? Bruker dere hjemmejournalen aktivt?

6. Ny teknologi og endringer i organisasjon og rutiner har ofte sine svakheter og mangler. Marte intro: (A-lag og B-lag på arbeidsplassen som følge av ulik mestring av data, bruk av post it lapper…)
Hva vil dere si er svakheter og mangler med Gerica? Hva har dere gjort for å kompensere for dette?

Sikkerhet og tidsbruk

Nå, som siste tema skal vi snakke om sikkerheten rundt multidose. Multidose ble innført for å bedre kvalitet i legemiddelhåndteringen og for å frigjøre sykepleiertid til andre oppgaver.

7. Først her skal vi ta utgangspunkt i bedring av kvalitet i legemiddelhåndteringen.
    a) Hvilke feil har tidligere vært mest vanlig i forbindelse med medisinering?
        i. Har sjansen for å gjøre noen av disse feilene blitt redusert/forsvunnet?
        ii. Har dere oppdaget nye muligheter for feil som kommer av det nye multidose systemet. Har dere eksempler på dette?
    b) Har pasientene blitt bedre til å ta medisinen sin? Hvorfor/hvorfor ikke? På hvilken måte?
    c) Har dere fått reaksjoner fra pasientene eller pårørende på multidose?
    d) Hvordan er overensstemmelsen av medisinlistene til hjemmesykepleien og fastlegen i forhold til tidligere?
    e) Er dere tryggere på at pasienten får det han/hun skal ha nå enn tidligere? Hvorfor/hvorfor ikke?
    f) Hvordan håndterer dere at noen pasienter skal ha noe medisin som ikke multidosesystemet tar seg av?

8. Nå skal vi diskutere den frigjorte sykepleiertiden og hva den blir brukt til.
    a) Bruker dere mer tid på pasientene? Hvorfor/hvorfor ikke?
    b) I hvilken grad benyttes ufaglærte i legemiddelhåndteringen? (mer/mindre)
    c) Dere doserer ikke legemidlene i like stor grad som før. Hvilke konsekvenser har det i forhold til å holde seg oppdatert på pasientenes medisiner og følge opp pasientene?
        i. Er oversikten over hva pasientene bruker av medisiner blitt bedre eller dårligere?
        ii. Er det blitt lettere eller vanskeligere å følge med på effekter og bivirkninger
        iii. Har den nye ordningen påvirket hvilken informasjon dere gir til pasientene om legemidler?

Oppsummering

Er dere fornøyd eller misfornøyde med at Trondheim kommune har tatt i bruk multidose?

Noe å tilføye?

Takk☺

SAMTALEGUIDE LEGESEKRETÆRER, torsdag 22. mars 2007

Introduksjon ved Marte

- Hva er et fokusgruppeintervju
- Om gjennomføringen

Implementering og organisasjonsutvikling

Først i samtalen med dere vil vi få rede på hva dere synes om multidose og hvordan innføringen av multidose har påvirket deres arbeidssituasjon.

1. Hva vet dere om multidose?
2. Hva er deres erfaring med oppstarten av multidose? (godt/ikke godt)
3. Har dere en egen legesekretær som er ansvarlig for å ivareta dialogen med pasientene og hjemmesykepleien ved bestillinger av medisiner? Hva er i så fall denne personen sin oppgave?
4. Har multidose endret på fordeling av arbeidsoppgavene internt på legesenteret i forhold til oppfølging av pasientene som mottar hjemmesykepleie?
    a. Legenes oppgaver
    b. Deres oppgaver
5. Hvor godt kjent er du med de skriftlige prosedyrene til Trondheim kommune som omhandler multidose? Hva med internettsiden til Trondheim kommune som omhandler multidose?
6. Har dere skriftliggjorte rutiner på legekontoret som omhandler medikamentbestillinger, om multidose, andre faste medisiner og om eventuellmedisiner

Samarbeid og kommunikasjon

Kommunikasjon og samarbeid har mye å si for hvor suksessfull informasjonsoverføringen er. Nå skal vi gå inn på tema om overføring av informasjon.

6. Hvilken informasjon og opplæring har dere fått om multidose?

7. Vi vil også høre om samarbeidet mellom de ulike partene (hjemmesykepleie, apotek, legesekretærer og fastlegene) som berøres av multidose.

a) Hvordan er informasjonsflyten internt på legekontoret (mellom legesekretærene og med legen) når det gjelder håndtering av multidosebrukerne?
b) Hvordan er informasjonsflyten mellom dere og hjemmesykepleien?
c) Hvordan er informasjonsflyten mellom dere og apotekene?
d) Får du all den informasjonen du trenger? (for mye, for lite)
e) Får du gitt videre all den informasjonen du vil?
f) Hva med samarbeid og kommunikasjon kan forbedres?

Sikkerhet og tidsbruk

8. Hvordan mener dere bruken av multidose påvirker sikkerheten for pasientene i forhold til medisinering? Har bidraget fra legekontoret i forhold til sikkerhet blitt endret som følge av multidose? (Hvorfor/Hvorfor ikke?)

9. Hvordan foregår oppdateringen av medisinlistene?

i. Hvem gjør denne oppgaven?
ii. Når blir denne oppgaven gjort? (ved konsultasjoner, telefonkontakt om endringer fra hjemmesykepleien, apotek, sykehus, sykehjem eller andre, ved årskontroll…)
iii. Blir endringer som skrives inn i medisinlisten kontrollerte? (Evt av hvem?)
iv. Føler dere dere trygge på at medisinlistene til enhver tid er oppdatert?

10. Har dere fått reaksjoner fra pasientene eller pårørende på multidose?

11. Hvordan påvirker multidose tidsbruken på legekontoret?

Oppsummering

Er dere fornøyde eller misfornøyde med at Trondheim kommune har begynt multidose?
Noe å tilføye?
Takk☺

Appendix Paper III

Samtykkebasert elektronisk legemiddelkort i Tromsø ☐☐☐

Til alle fastleger i Tromsø kommune

Samarbeid mellom fastlegene og hjemmetjenesten om medisinering av felles pasienter

Alder: ☐☐ år

Arbeidssted: _____

Antall pasienter på fastlegeliste: ☐☐☐☐ personer

Hvor lenge har du jobbet i allmennpraksis? ☐☐ år

Er du spesialist i allmennmedisin? ☐ Ja ☐ Nei

Type praksis: ☐ Enlegepraksis ☐ Flerlegekontor/praksisfellesskap

1. Hvor mange soner innen hjemmesykepleien vil du anslå at du har pasienter felles med? ☐☐ soner

2. Fremgår det tydelig av journalen at hjemmesykepleien har overtatt håndtering av medikamenter? ☐ Alltid ☐ Noen ganger ☐ Som regel ☐ Aldri

3. Hvordan foregår reseptforskrivningen til hjemmesykepleien sine pasienter?

   a. Hvordan mottar du bestilling av resepter fra hjemmesykepleien: ☐ Muntlig/per telefon ☐ Skriftlig

   b. Hvem fyller vanligvis ut resepter som bestilles av hjemmesykepleien? ☐ Legen ☐ Medarbeider

   Evt.kommentarer: _____

   _____

   c. Bruker du å kontrollere bestillingen mot opplysninger i journalen?
      ☐ Rutinemessig
      ☐ Bare ved tvil, og evt. ved spørsmål/oppfordring fra medarbeider

   d. Hvordan leveres eller sendes vanligvis de ferdige reseptene?
      ☐ Blir sendt til eller hentet av hjemmesykepleien
      ☐ Blir sendt til pasienten selv eller til pårørende
      ☐ Sendes til apoteket i posten
      ☐ Fakses til apoteket

4. Benytter du deg av muligheten til å skrive ut og sende med et medisinkort fra journalen når medisineringen blir endret?
   ☐ Alltid ☐ Noen ganger
   ☐ Som regel ☐ Aldri

5. Hvilke rutiner har du for å oppdatere hjemmesykepleien på endringer i medisinforskrivning når det gjelder dine pasienter?

   ☐ Hjemmesykepleien blir rutinemessig kontaktet per telefon/får beskjed skriftlig ved endringer
   ☐ Hjemmesykepleien blir vanligvis oppdatert gjennom reseptene som utskrives
   ☐ Gir vanligvis beskjed via pasienten eller pårørende
   ☐ Ved hjelp av kommunikasjonsark/hjemmejournal
   ☐ Annet

6. Hvilke rutiner har du for å oppdatere hjemmesykepleien på endringer i medisinforskrivning når det gjelder pasienter du behandler under legevakt?

   ☐ Hjemmesykepleien blir rutinemessig kontaktet per telefon/får beskjed skriftlig eller muntlig ved endringer
   ☐ Hjemmesykepleien blir vanligvis oppdatert gjennom reseptene som utskrives
   ☐ Gir vanligvis beskjed gjennom pasienten eller pårørende
   ☐ Ved hjelp av kommunikasjonsark/hjemmejournal

   ☐ Annet _____
   ☐ Deltar ikke på legevakt

7. Hvis du ser bort fra epikriser, blir du oppdatert av hjemmesykepleien når andre leger gjør endringer i medisinforskriving?

   ☐ Legekontoret blir rutinemessig kontaktet og oppdatert om nye forskrivninger og endringer
   ☐ Jeg blir oppdatert om andres forskrivninger i ettertid i møter med hjemmesykepleien
   ☐ Journalen blir bare oppdatert ved at resepter utskrives

   ☐ Annet _____

8. Oppdaterer du "faste medisiner" fortløpende i ditt journalsystem? ☐ Alltid ☐ Noen ganger ☐ Som regel ☐ Aldri

   Kommentarer: _____

   _____

9. Når pasienten har behov for hjelp med medisinhåndteringen og hjemmesykepleien overtar ansvaret for utdelingen av medisin:

   a. inngår du skriftlig avtale med pasienten og hjemmetjenesten ☐ Alltid ☐ Noen ganger ☐ Som regel ☐ Aldri

   b. Vurderer du pasientens samtykkekompetanse før avtale inngås? ☐ Alltid ☐ Noen ganger ☐ Som regel ☐ Aldri

   c. Hvem forholder du deg til hvis pasienten ikke har samtykkekompetanse?

      ☐ Nærmeste pårørende ☐ Hjelpeverge ☐ Tar beslutningen selv ☐ Andre

10. Hvilke rutiner har legekontoret for kommunikasjon med hjemmesykepleien vedrørende dosering av Marevan?

- ☐ Det skjer som oftest bare per telefon/muntlig
- ☐ Informasjon utveksles vanligvis bare skriftlig/bruk av doseringskort
- ☐ Informasjon formidles både skriftlig og muntlig
- ☐ Annet _____

11. Hvilke rutiner har legekontoret for kommunikasjon med hjemmesykepleien vedrørende blodprøveresultater

- ☐ Det skjer som oftest bare muntlig eller per telefon
- ☐ Informasjon utveksles vanligvis bare skriftlig
- ☐ Informasjon formidles både skriftlig og muntlig
- ☐ Annet _____

Innføring av multidosepakkede legemidler i Trondheim
Samtykkebasert elektronisk medisinkort i Trondheim

Til alle fastleger i Trondheim kommune

Samarbeid mellom fastlegene og hjemmetjenesten om medisinering av felles pasienter

Alder: ☐☐ år

Arbeidssted: _____

Antall pasienter på fastlegeliste: ☐☐☐☐ personer

Hvor lenge har du jobbet i allmennpraksis? ☐☐ år

Er du spesialist i allmennmedisin? ☐ Ja ☐ Nei

Type praksis: ☐ Enlegepraksis ☐ Flerlegekontor/praksisfellesskap

1. Hvor mange soner innen hjemmesykepleien vil du anslå at du har pasienter felles med? ☐☐ soner

2. Fremgår det tydelig av journalen at hjemmesykepleien har overtatt håndtering av medikamenter? ☐ Alltid ☐ Noen ganger ☐ Som regel ☐ Aldri

3. Hvordan foregår reseptforskrivningen til hjemmesykepleien sine pasienter?

   a. Hvordan mottar du bestilling av resepter fra hjemmesykepleien: ☐ Muntlig/per telefon ☐ Skriftlig

   b. Hvem fyller vanligvis ut resepter som bestilles av hjemmesykepleien? ☐ Legen ☐ Medarbeider

   Evt.kommentarer: _____

   _____

   c. Bruker du å kontrollere bestillingen mot opplysninger i journalen?
      ☐ Rutinemessig
      ☐ Bare ved tvil, og evt. ved spørsmål/oppfordring fra medarbeider

   d. Hvordan leveres eller sendes vanligvis de ferdige reseptene?
      ☐ Blir sendt til eller hentet av hjemmesykepleien
      ☐ Blir sendt til pasienten selv eller til pårørende
      ☐ Sendes til apoteket i posten
      ☐ Fakses til apoteket

4. Benytter du deg av muligheten til å skrive ut og sende med et medisinkort fra journalen når medisineringen blir endret?
   ☐ Alltid ☐ Noen ganger
   ☐ Som regel ☐ Aldri

Draft

5. Hvilke rutiner har du for å oppdatere hjemmesykepleien på endringer i medisinforskrivning når det gjelder dine pasienter?

   ☐ Hjemmesykepleien blir rutinemessig kontaktet per telefon/får beskjed skriftlig ved endringer
   ☐ Hjemmesykepleien blir vanligvis oppdatert gjennom reseptene som utskrives
   ☐ Gir vanligvis beskjed via pasienten eller pårørende
   ☐ Ved hjelp av kommunikasjonsark/hjemmejournal
   ☐ Annet

6. Hvilke rutiner har du for å oppdatere hjemmesykepleien på endringer i medisinforskrivning når det gjelder pasienter du behandler under legevakt?

   ☐ Hjemmesykepleien blir rutinemessig kontaktet per telefon/får beskjed skriftlig eller muntlig ved endringer
   ☐ Hjemmesykepleien blir vanligvis oppdatert gjennom reseptene som utskrives
   ☐ Gir vanligvis beskjed gjennom pasienten eller pårørende
   ☐ Ved hjelp av kommunikasjonsark/hjemmejournal

   ☐ Annet _____
   ☐ Deltar ikke på legevakt

7. Hvis du ser bort fra epikriser, blir du oppdatert av hjemmesykepleien når andre leger gjør endringer i medisinforskriving?

   ☐ Legekontoret blir rutinemessig kontaktet og oppdatert om nye forskrivninger og endringer
   ☐ Jeg blir oppdatert om andres forskrivninger i ettertid i møter med hjemmesykepleien
   ☐ Journalen blir bare oppdatert ved at resepter utskrives

   ☐ Annet _____

8. Oppdaterer du "faste medisiner" fortløpende i ditt journalsystem? ☐ Alltid ☐ Noen ganger ☐ Som regel ☐ Aldri

   Evt.kommentarer: _____

   _____

9. Når pasienten har behov for hjelp med medisinhåndteringen og hjemmesykepleien overtar ansvaret for utdelingen av medisin:

   a. Ber du om pasientens samtykke til at du tar kontakt med forvaltningskontoret for kommunalt vedtak på bistand? ☐ Alltid ☐ Noen ganger ☐ Som regel ☐ Aldri

   b. Vurderer du samtykkekompetanse før du tar kontakt? ☐ Alltid ☐ Noen ganger ☐ Som regel ☐ Aldri

   c. Hvem forholder du deg til hvis pasienten ikke har samtykkekompetanse?

      ☐ Nærmeste pårørende ☐ Hjelpeverge ☐ Tar beslutningen selv ☐ Andre

10. Hvilke rutiner har legekontoret for kommunikasjon med hjemmesykepleien vedrørende dosering av Marevan?

☐ Det skjer som oftest bare per telefon/muntlig
☐ Informasjon utveksles vanligvis bare skriftlig/bruk av doseringskort
☐ Informasjon formidles både skriftlig og muntlig

☐ Annet _____

11. Hvilke rutiner har legekontoret for kommunikasjon med hjemmesykepleien vedrørende blodprøveresultater

☐ Det skjer som oftest bare muntlig eller per telefon
☐ Informasjon utveksles vanligvis bare skriftlig
☐ Informasjon formidles både skriftlig og muntlig

☐ Annet _____

12. Du har nå mottatt informasjon om multidosepakkede legemidler og hvordan dette vil kunne påvirke ditt samarbeide med hjemmesykepleien og apotek angående medisineringen av felles pasienter. Hvilke endringer mener du det nye doseringssystemet vil kunne medføre?

	Mer	Uendret	Mindre
Oversikt over pasientenes legemidler	☐	☐	☐
Feilmedisinering	☐	☐	☐
Samarbeid med hjemmesykepleien	☐	☐	☐
Arbeid for legen	☐	☐	☐
Arbeid for medarbeider	☐	☐	☐
Arbeid for hjemmesykepleien	☐	☐	☐
Kassasjon av legemidler	☐	☐	☐

Ser du andre fordeler eller ulemper med systemet? _____

_____

_____

13. Du har også mottatt informasjon om Fyrtårnsprosjektet i Trondheim og innføringen av samtykkebaserte elektroniske medisinkort. Hvilke endringer mener du denne nye løsningen vil kunne medføre?

	Mer	Uendret	Mindre
Oversikt over pasientenes legemidler	☐	☐	☐
Feilmedisinering	☐	☐	☐
Samarbeid med hjemmesykepleien	☐	☐	☐
Arbeid for legen	☐	☐	☐
Arbeid for medarbeider	☐	☐	☐
Arbeid for hjemmesykepleien	☐	☐	☐
Fare for brudd på taushetsplikten	☐	☐	☐

Ser du andre fordeler eller ulemper med systemet? _____

_____

_____

Til alle fastleger i Tromsø kommune

Samarbeid mellom fastlegene og hjemmetjenesten om medisinering av felles pasienter

Alder: ☐☐ år

Kjønn: ☐ Kvinne ☐ Mann

Antall pasienter på fastlegeliste: ☐☐☐☐ personer

Hvor lenge har du jobbet i allmennpraksis? ☐☐ år

Er du spesialist i allmennmedisin? ☐ Ja ☐ Nei

1. Hvor mange soner innen hjemmetjenesten vil du anslå at du har pasienter felles med?
   ☐ 1-5 ☐ 6-10 ☐ mer enn 10

Merking i journal

2. Fremgår det tydelig av journalen at hjemmetjenesten har overtatt håndtering av medikamenter for pasienten?
   ☐ Alltid ☐ Som regel ☐ Noen ganger ☐ Aldri

Resepthåndtering

3. Spørsmål angående resepthåndtering

   a. Hvordan mottar du bestilling av resepter? (flere kryss mulig)
   - ☐ Muntlig/per telefon fra hjemmetjenesten
   - ☐ Skriftlig/fax fra hjemmetjenesten
   - ☐ Muntlig/per telefon fra apoteket
   - ☐ Skriftlig/fax fra apoteket

   b. Hvem fyller vanligvis ut resepter som bestilles av hjemmetjenesten?
   - ☐ Legen
   - ☐ Medarbeider

   Evt.kommentarer:_____

   _____

c. Bruker du å kontrollere bestillingen mot opplysninger i journalen?

☐ Rutinemessig
☐ Bare ved tvil, og evt. ved spørsmål/oppfordring fra medarbeider

d. Hvordan leveres eller sendes vanligvis de ferdige reseptene? (flere kryss mulig)

☐ Hentes av- eller sendes/leveres hjemmetjenesten
☐ Sendes til pasienten selv eller pårørende
☐ Sendes eller fakses til apoteket

Kommunikasjon om endringer i medisineringen

4. Informasjon om endringer i medisinering

a. Pleier du å skrive ut og sende med pasienten en medisinliste fra journalen når endringer gjøres under konsultasjon?

☐ Alltid ☐ Som regel ☐ Noen ganger ☐ Aldri

b. Kontakter du hjemmetjenesten ved endringer?

☐ Rutinemessig ☐ Som regel ☐ Noen ganger ☐ Aldri

c. Kontaktform til hjemmetjenesten (flere kryss mulig)

☐ Per telefon
☐ Får beskjed skriftlig ved endringer
☐ Gjennom reseptene som utskrives
☐ Beskjed via pasienten eller pårørende
☐ Ved hjelp av kommunikasjonsark/hjemmejournal
☐ Annet

d. Kontakter du apoteket ved endringer?

☐ Rutinemessig ☐ Som regel ☐ Noen ganger ☐ Aldri

5. Hvilke rutiner har du for å oppdatere hjemmetjenesten på endringer i medisinforskrivningen når det gjelder pasienter du behandler under legevakt? (flere kryss mulig)

☐ Hjemmetjenesten blir rutinemessig kontaktet per telefon/får beskjed skriftlig eller muntlig ved endringer
☐ Hjemmetjenesten blir vanligvis oppdatert gjennom reseptene som utskrives
☐ Gir vanligvis beskjed gjennom pasienten eller pårørende
☐ Overlater vanligvis til fastlegen å informere om endringer
☐ Ved hjelp av kommunikasjonsark/hjemmejournal

☐ Annet _____
☐ Deltar ikke på legevakt

6. Hvis du ser bort fra epikriser, blir du oppdatert av hjemmetjenesten når andre leger gjør endringer i medisinforskriving? (flere kryss mulig)

☐ Legekontoret blir rutinemessig kontaktet og oppdatert om nye forskrivninger og endringer
☐ Jeg blir oppdatert om andres forskrivninger i ettertid i møter med hjemmetjenesten

☐ Journalen blir bare oppdatert ved at resepter skal fornyes

☐ Annet _____

7. Oppdaterer du "faste medisiner" fortløpende i ditt journalsystem?

☐ Alltid ☐ Som regel ☐ Noen ganger ☐ Aldri

Evt.kommentarer: _____

_____

8. Hvilke rutiner har legekontoret for kommunikasjon med hjemmetjenesten vedrørende dosering av Marevan? (flere kryss mulig)

☐ Det skjer som oftest bare per telefon/muntlig
☐ Informasjon utveksles vanligvis bare skriftlig/bruk av doseringskort
☐ Informasjon formidles både skriftlig og muntlig til hjemmetjenesten
☐ Informasjon formidles både skriftlig og muntlig til apoteket

☐ Annet _____

Innføring av multidosepakkede legemidler i Trondheim ☐☐☐

Til alle fastleger i Trondheim kommune

Samarbeid mellom fastlegene og hjemmetjenesten om medisinering av felles pasienter

Alder: ☐☐ år

Kjønn: ☐ Kvinne ☐ Mann

Antall pasienter på fastlegeliste: ☐☐☐☐ personer

Hvor lenge har du jobbet i allmennpraksis? ☐☐ år

Er du spesialist i allmennmedisin? ☐ Ja ☐ Nei

1. Hvor mange soner innen hjemmetjenesten vil du anslå at du har pasienter felles med?
   ☐ 1-5 ☐ 6-10 ☐ mer enn 10

2. Hvor mange av dine pasienter vil du anslå mottar multidose?
   ☐ Ingen ☐ 1-5 ☐ 6-10 ☐ mer enn 10

Merking i journal

3. For de pasientene som ikke mottar multidose: Fremgår det tydelig av journalen at hjemmetjenesten har overtatt håndtering av medikamenter for pasienten?
   ☐ Alltid ☐ Som regel ☐ Noen ganger ☐ Aldri

4. For pasienter som har tatt i bruk multidose: Fremgår det tydelig av journalen at vedkommende er multidosebruker?
   ☐ Alltid ☐ Som regel ☐ Noen ganger ☐ Aldri

Resepthåndtering

5. Spørsmål angående resepthåndtering til pasienter som ikke bruker multidose

   a. Hvordan mottar du bestilling av resepter (Flere kryss mulig)
   - ☐ Muntlig/per telefon fra hjemmetjenesten
   - ☐ Skriftlig/fax fra hjemmetjenesten
   - ☐ Muntlig/per telefon fra apoteket
   - ☐ Skriftlig/fax fra apoteket

   b. Hvem fyller vanligvis ut resepter som bestilles av hjemmetjenesten?
   - ☐ Legen
   - ☐ Medarbeider

Evt.kommentarer: _____

_____

c. Bruker du å kontrollere bestillingen mot opplysninger i journalen?

☐ Rutinemessig
☐ Bare ved tvil, og evt. ved spørsmål/oppfordring fra medarbeider

d. Hvordan leveres eller sendes vanligvis de ferdige reseptene? (flere kryss mulig)

☐ Hentes av- eller sendes/leveres hjemmetjenesten
☐ Sendes til pasienten selv eller pårørende
☐ Sendes eller fakses til apoteket

6. Spørsmål angående resepthåndtering til pasienter som har tatt i bruk multidose

a) Hvem skriver vanligvis ut medisinlisten (gjelder som resept) som bestilles av apoteket?

☐ Legen
☐ Medarbeider

Evt.kommentarer: _____

_____

b) Bruker du å kontrollere medisinlisten mot opplysninger i journalen?

☐ Rutinemessig
☐ Bare ved tvil, og evt. ved spørsmål/oppfordring fra medarbeider

c) Hvordan leveres eller sendes vanligvis medisinlistene?

☐ Sendes til apoteket i posten
☐ Fakses til apoteket
☐ Annet:

Kommunikasjon om endringer i medisineringen

7. Informasjon om endringer i medisinering av pasienter som ikke bruker multidose

a. Pleier du å skrive ut og sende med pasienten en medisinliste fra journalen når endringer gjøres under konsultasjon?

☐ Alltid ☐ Som regel ☐ Noen ganger ☐ Aldri

b. Kontakter du hjemmetjenesten ved endringer?

☐ Rutinemessig ☐ Som regel ☐ Noen ganger ☐ Aldri

c. Kontaktform til hjemmetjenesten (flere kryss mulig)

- ☐ Per telefon
- ☐ Får beskjed skriftlig ved endringer
- ☐ Gjennom reseptene som utskrives
- ☐ Beskjed via pasienten eller pårørende
- ☐ Ved hjelp av kommunikasjonsark/hjemmejournal
- ☐ Annet

d. Kontakter du apoteket ved endringer?

☐ Rutinemessig ☐ Som regel ☐ Noen ganger ☐ Aldri

8. Informasjon om endringer i medisinering av pasienter som har tatt i bruk multidose

a. Pleier du å skrive ut og sende med pasienten en medisinliste fra journalen når endringer gjøres under konsultasjon?

☐ Alltid ☐ Som regel ☐ Noen ganger ☐ Aldri

b. Kontakter du hjemmetjenesten ved endringer?

☐ Rutinemessig ☐ Som regel ☐ Noen ganger ☐ Aldri

c. Kontaktform til hjemmetjenesten (flere kryss mulig)

- ☐ Per telefon
- ☐ Får beskjed skriftlig ved endringer
- ☐ Gjennom reseptene som utskrives
- ☐ Beskjed via pasienten eller pårørende
- ☐ Ved hjelp av kommunikasjonsark/hjemmejournal
- ☐ Annet

d. Kontakter du apoteket ved endringer?

☐ Rutinemessig ☐ Som regel ☐ Noen ganger ☐ Aldri

9. Hvilke rutiner har du for å oppdatere hjemmetjenesten på endringer i medisinforskrivningen når det gjelder pasienter du behandler under legevakt? (flere kryss mulig)

- ☐ Hjemmetjenesten blir rutinemessig kontaktet per telefon/får beskjed skriftlig eller muntlig ved endringer
- ☐ Hjemmetjenesten blir vanligvis oppdatert gjennom reseptene som utskrives
- ☐ Gir vanligvis beskjed gjennom pasienten eller pårørende
- ☐ Overlater vanligvis til fastlegen å informere om endringer
- ☐ Ved hjelp av kommunikasjonsark/hjemmejournal

- ☐ Annet _____
- ☐ Deltar ikke på legevakt

10. Hvis du ser bort fra epikriser, hvordan blir du oppdatert når andre leger gjør endringer i medisinforskriving til pasienter som ikke bruker multidose? (flere kryss mulig)

☐ Jeg blir rutinemessig kontaktet og oppdatert om nye forskrivninger og endringer av hjemmetjenesten
☐ Jeg blir rutinemessig kontaktet og oppdatert om nye forskrivninger og endringer av apoteket
☐ Jeg blir oppdatert om andres forskrivninger i ettertid i møter med hjemmetjenesten

☐ Annet _____

11. Hvis du ser bort fra epikriser, hvordan blir du oppdatert når andre leger gjør endringer i medisinforskriving til multidosepasienter? (flere kryss mulig)

☐ Jeg blir rutinemessig kontaktet og oppdatert om nye forskrivninger og endringer fra hjemmetjenesten
☐ Jeg blir rutinemessig kontaktet og oppdatert om nye forskrivninger og endringer av apoteket
☐ Jeg blir oppdatert om andres forskrivninger i ettertid i møter med hjemmetjenesten

☐ Annet _____

12. Oppdaterer du "faste medisiner" fortløpende i ditt journalsystem?

☐ Alltid ☐ Som regel ☐ Noen ganger ☐ Aldri

Evt.kommentarer: _____

_____

13. For multidosebrukere: Hvilken doseringsmåte er mest vanlig for Marevan i din praksis?

☐ I multidose ☐ I dosett

14. For pasienter som ikke bruker multidose: Hvilke rutiner har legekontoret for kommunikasjon med hjemmetjenesten vedrørende dosering av Marevan? (flere kryss mulig)

☐ Det skjer som oftest bare per telefon/muntlig
☐ Informasjon utveksles vanligvis bare skriftlig/bruk av doseringskort
☐ Informasjon formidles både skriftlig og muntlig til hjemmetjenesten
☐ Informasjon formidles både skriftlig og muntlig til apoteket

☐ Annet _____

15. For pasienter som får Marevan i multidosepakning: Hvilke rutiner har legekontoret for kommunikasjon med hjemmetjenesten vedrørende dosering av Marevan? (flere kryss mulig)

- ☐ Det skjer som oftest bare per telefon/muntlig
- ☐ Informasjon utveksles vanligvis bare skriftlig/bruk av doseringskort
- ☐ Informasjon formidles både skriftlig og muntlig til hjemmetjenesten
- ☐ Informasjon formidles både skriftlig og muntlig til apoteket

☐ Annet _____

16. Hvilke endringer mener du multidose har medført?

	Mer	Uendret	Mindre
Oversikt over pasientenes legemidler	☐	☐	☐
Feilmedisinering	☐	☐	☐
Samarbeid med hjemmetjenesten	☐	☐	☐
Samarbeide med apoteket	☐	☐	☐
Arbeid for legen	☐	☐	☐
Arbeid for medarbeider	☐	☐	☐
Arbeid for hjemmetjenesten	☐	☐	☐
Kassasjon av legemidler	☐	☐	☐

17. I hjemmetjenesten i Trondheim gjøres all forskrivning av legemidler til multidose av fastlegen. Hvem mener du bør kunne forskrive legemidler for multidose? (Flere kryss mulig)

- ☐ Fastlegen (og fastlegens vikar)
- ☐ Legevaktslege
- ☐ Sykehuslege ved utskrivning
- ☐ Sykehjemslege ved utskrivning
- ☐ Privatpraktiserende spesialist
- ☐ Annen tilfeldig lege

Kommentarer: _____

18.Ser du andre fordeler eller ulemper med multidosesystemet?

_____

_____

_____

19.Vil du foretrekke fortsatt bruk av multidose i hjemmetjenesten i fremtiden?

☐ Ja ☐ Nei ☐ Vet ikke

Hvorfor/hvorfor ikke? _____

_____

_____

Paper I

Is not included due to copyright

Paper II

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healthcare

ORIGINAL ARTICLE

Early experiences with the multidose drug dispensing system – A matter of trust?

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Abstract

Objective. To study early experiences with multidose drug dispensing (MDD) among different groups of health personnel. *Design.* Qualitative study based on focus-group interviews. *Setting.* Primary health care, Trondheim, Norway. *Main outcome*. The importance of trust in the technology and in collaborating partners is actualized in the early implementation of MDD. *Results.* GPs, home-care nurses, pharmacists, and medical secretaries trusted the new MDD technology. The quality of the GPs' medication records improved. However, health personnel, including the GPs themselves, would not always trust the medication records of the GPs. Checking the multidose bags arriving from the pharmacy was considered unnecessary in the written routines dealing with MDD. However, home-care nurses experienced errors and continued to manually check the bags. Nurses in the home-care service felt a loss of knowledge with regard to the patients' medications and in turn experienced reduced ability to give medical information to patients and to observe the effects of the drugs. The home-care services' routines for drug handling were not always trusted by the other groups of health personnel involved. *Conclusion.* Health personnel faced some challenges during the implementation of the MDD system, but most of them remained confident in the new system. Building trust has to be a process that runs in parallel with the introduction of new technology and the establishment of new routines for improving the quality in handling of medicines and to facilitate better cooperation and communication.

Key Words: *Drug packaging, family practice, home-care services, information sharing, medication errors, medication records, pharmacy, trust*

Multidose drug dispensing (MDD) is a "new" expansive field in the Scandinavian countries, both in the community care settings and in the nursing home setting. MDD is recommended by health authorities, motivated by expected savings in terms of medication dispensing errors and drug expenses [1–3]. However, scientific evaluations are missing [3,4]. MDD implies that the patient receives drugs machine-dispensed into one unit for each dose occasion, packed in disposable bags. The dose unit bags are labelled with patient data, drug contents data, and time for intake [5–7].

MDD was implemented in the home-care services in Trondheim, Norway, in 2006. The implementation was accomplished in a complex organization including pharmacies, home-care services, and GPs' offices. At the time of implementation the home-care services were organized into 27 home-care divisions in four town districts. A total of 137 GPs participated, and five pharmacies were involved as MDD providers. The home-care service administrated drugs for approximately 1800 out of 3000 patients receiving home-care. One of the major suppliers of multidose drugs in Norway was responsible for the production of the new drug packages and distributing them to the pharmacies. In addition to dispensing the patients' multidose drugs to the different home-care divisions, the pharmacies were also charged with updating the medication record in the multidose provider's database and making reviews of

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Trust is an important issue for health personnel in an early phase of the implementation of a multidose drug dispensing (MDD) system:

- Trust in the MDD system was challenged by medication records being outdated and the loss of flexibility in choosing and dosing drugs.
- Changes in routines and roles required a higher level of trust between professionals.
- Home-care nurses feared a loss of competence in following up patients and drug effects because of reduced time spent on medications.

the patients' prescriptions whenever changes were made by the GP (in addition to an annual review).

A project group was appointed to prepare and assist the implementation process. Information dissemination was emphasized to create involvement, motivation, and commitment among the users. It was also requested that the home-care divisions and the pharmacies appointed a specific MDD contact person to function as a contact point for the different organizations.

Unlike most other municipalities using MDD in Norway, Trondheim decided to use the GP's medication record in the electronic health record (EHR) as the master medication record. Hence, other health personnel had to update the medication record in their own EHR in accordance with the GP's medication record. Only the patient's GP was allowed to prescribe drugs to be included in the multidose drug packages.

The aim of this project was to study early experiences amongst the different groups of health professionals participating in the implementation of the MDD system. Several significant issues were brought up during the interview sessions but, already at an early stage of analysing the data, trust stood out as an important concern in all groups. In this article we have explored in depth the users' experiences with the MDD related to trust –in terms of both trust in the MDD system and trust within and between groups of collaborating health personnel. The users' experiences with the MDD system covered the handling of drugs from prescribing to administration of drugs to the patient.

Material and methods

Four focus-group interviews were carried out in March 2007, about one year after the introduction of MDD. We performed a careful selection of health personnel with varied MDD experience; the selection spanned different workplaces and personnel with different roles in the handling of MDD, thus obtaining data-source triangulation [8]. The four groups contained six home-care nurses, five pharmacists, six GP medical secretaries, and seven GPs. The focus-group interviews lasted from 70 to 110 minutes.

A master's student in sociology, trained in conducting focus-group interviews, opened and moderated the interviews. The moderator used an interview guide tailored to each group, but with some themes common to all of the groups (Table I). During the interviews the informants shared experiences and reflections related to the implementation and use of MDD. The interviews were observed and videotaped by the first author. Afterwards the interviews were transcribed verbatim by the moderator and checked by the first author.

Data were analysed by the authors through systematic text condensation, an approach described by Giorgi [9] and modified by Malterud [10]. We started the analysis by using the themes from the interview guide as point of departure for defining key categories. However, the issue of trust distinguished itself as a theme that was raised by many of our informants. This led us to adopt trust as a governing idea throughout the analysis. This emphasis on trust from the informants when reflecting on their experiences with MDD is thus a result in itself, but was also used to structure our analysis.

Observation triangulation was achieved through independent analysis of the transcribed interviews by

Table I. Themes in the interview guides and example questions from the focus-group interviews.

Themes	Example questions
Implementation and organizational development	How did the implementation of multidose progress? How did the implementation change the distribution of work at your workplace?
Cooperation and communication	How is the flow of information between you and the home-care service? (question directed to doctors, medical secretaries, and pharmacists) What can be improved with regard to communication?
Patient safety and time use	In what way does use of the multidose dispensed drugs influence patient safety? Do you take up more time on patients after the implementation of MDD? Why/why not? (question directed to nurses in the home-care services)

the three authors [8]. The first and third author have extensive clinical experience in the field as a community pharmacist and former GP, respectively. In addition the second and third author have experience from research on collaboration in health care as respectively a social scientist and a public health researcher.

Results

Trust – both in the MDD system and in colleagues – was a central issue for all the informants when discussing their experiences related to MDD.

Trust in the MDD system

Most of the participants expressed positive attitudes towards the MDD system, and frequently – either directly or indirectly – related it to trust. In general it was expected that the MDD system would lead to more trustworthy handling of drugs and fewer dispensing errors, as illustrated by the following quote:

> *I know someone … who told me that the mother became completely healthy when she began with this [multidose dispensed drugs]. She stopped the stumbling and lurching and everything. So it turns out that she must have been mixing. She became a new person…. Because when she got what she was supposed to get, at the right time … it didn't take long … before they said, "now, she is in such good health".* (Medical secretary)

However, one of the nurses explained that they kept on checking the multidose drug packages as they arrived from the pharmacy. This was done even though it was considered unnecessary in the written routines handed out with the implementation of MDD and may indicate that they did not really have complete trust in the MDD system after all.

Prescriptions of drugs with an interim change in dosage and as an interim cure were considered problematic in the MDD system, as was handling of warfarin:

> *… when it comes to short adjustments of medications and adjustments of furosemide in a short period or a cure, it is in many cases more difficult to go through with after the implementation of MDD. (GP)*
>
> *I think warfarin has been a difficult thing. I had a patient who had an incorrect warfarin dosage for eight weeks due to failure in MDD. And what happened I do not really know … (GP)*

The quotes indicate that the MDD system is perceived as less flexible when it comes to changes in medication/dosage than the old, manual system.

Moreover, all the groups of health personnel faced an increased need for cooperation and communication among themselves during the implementation of MDD. The fact that the MDD system required more communication and stronger involvement of the GPs and in particular the pharmacies can be interpreted as caused by health personnel not completely trusting the system. One of the GPs said that he regarded "the pharmacy as a safety net in terms of dosages to patients", illustrating the important role of the pharmacy in creating a trustworthy system for MDD.

Trust among the other groups of health personnel

Errors made in the home-care service after the implementation of MDD were reported both by pharmacists and by GPs.

> *In the case I was talking about, it was one [a home-care nurse] who gave an antidepressant that was discontinued. The doctor thought he'd try a new type, which was packaged in the MDD, but the home-care gave the other in addition.* (Pharmacist)

These and similar observations challenged the trust in the routines of the home-care services. The cooperating professions did not always trust the GP's updates to the medication record either. The medication records were needed for prescriptions of multidose drugs. Home-care nurses experienced difficulties with getting in touch with GPs in order to make them update and hand over medication records.

> *[Cooperation with] the pharmacies works very smoothly. Doctors, too, but it takes time…. That's the problem; they may not call back.* (Nurse)

The GPs and the medical secretaries confirmed the problems and blamed insufficient information and follow-up from the project group responsible for implementation. The pharmacists also experienced insufficient updates of the medication records by the GPs.

> *I called the doctor and received the prescription over the phone. Next time we got it [the medication record] the doctor had not changed it. The doctor only said yes on the phone…. That's why we agreed to get everything [new prescriptions] in writing. The doctor now faxes us.* (Pharmacist)

GPs and nurses stated that the implementation of MDD led to an increased dialogue between them

concerning which drugs should be administered "as required" (pro re nata). For practical reasons the home-care wanted as much as possible to be packed in the multidose bags while the GPs often wanted some drugs, such as sleeping pills, to be taken only when required. Both parties were content with this increased level of dialogue, as it in the end is beneficial to the welfare of the patient.

Trust within the different groups of health personnel

The home-care nurses were concerned about the reduction in manual dispensing of drugs. They feared that this would decrease their knowledge of patients' health in relation to his/her drug intake, and make them, as a group, less trusted concerning these questions. A nurse said:

> *I guess we had better overview before [the introduction of MDD]…. Now, of course we have lost it, and then I think in the long run I will lose the overview over the patient's condition….Also, when you sit and dose medicines manually, you think and reflect on the patient you are dosing for…. Then you sit and think about how it works for him and: "This should have been checked, and is it really necessary to take this [drug]?" Now I hardly reflect on it, and that's a little scary.* (Nurse)

However, both the pharmacists and the GPs experienced a greater influence on drug dispensing, and they both argued for improved quality in the handling of drugs after the implementation of MDD. This happened despite the fact that the doctors admitted that not all GPs work at the same level of accuracy with regard to medication records, in effect saying that not all GPs' medication records were to be trusted:

> *… doctors have varying levels of accuracy, then. Some are very accurate and some are not. It is much more comfortable to be a stand-in for the doctors who are relatively accurate than for the others.* (GP)

The medical secretaries also confirmed this:

> *Yes, there have been changes [in drug prescriptions] and in and out of hospital, they [GPs] need to update them [the medical records] then. They have not always been so good at it previously.* (Medical secretary)

The GPs believed that electronic communication could improve the exchange of information and updating, and thus produce an even better effect from the MDD system.

Discussion

This study has demonstrated that health personnel preserved trust in the MDD system even if the system caused new errors and changes to the routines and roles of the health personnel involved. The impact of healthcare professionals' attitudes towards the new system and views concerning their own and others' roles are likely to affect the implementation process and outcome.

Limitations of the study

Focus-group interviews were conducted to get a better understanding of the attitudes and experiences among involved health personnel in relation to implementation of MDD in the home-care services [11]. The results stem from a single implementation and any generalization of the findings should be made cautiously. Successful implementation of a new technology in one organization might well become a failure in another [12].

The first author was observing the interviews. She was also a member of the project group responsible for the implementation of MDD and has been a community pharmacist engaged in researching methods to reduce the number of medical errors in primary care. This might have influenced how the participants expressed their attitudes towards the MDD system and the implementation process, as well as the role of pharmacists. Observer triangulation was used to diminish this risk of bias.

The timing of the interviews in relation to the implementation process also has to be considered. In an early phase of implementation, engagement and an optimistic attitude may influence the way the people involved describe a new system [13]. However, later on they might have adapted to problems by way of "work-arounds" [14].

New technology and the significance of trust

The issue of trust stands out as important in respect of any system implementation [15]. The details surrounding the MDD system are mostly invisible to the health personnel, and the work put into it is to some extent also separated in both time and space from the end-users. Hence it may be understood and analysed as an abstract (expert) system [16]. In addition, the implementation of systems and concurrent reorganization of work raise the issue of trust in colleagues. This makes it important to understand the relationship and interplay between system trust and personal trust to be able to understand the intra-organizational implementation process [17].

We would argue that trust in the MDD system and the new professional roles were established through the implementation process. The implementation project succeeded in involving the affected health personnel in the planning of the new system. It established responsibility as well as new uniform collaboration routines. These are important success factors, as underlined by others who have studied implementation of MDD systems [4,18]. However, we have not been able to find any other studies explicitly discussing trust as an issue in drug dispensing.

The informants indicated a common expectation for the MDD system to reduce the discrepancies between medication records at the GPs' practices and in the home-care services. In a parallel study undertaken by the authors, their expectations were largely confirmed [19]. Even so, health personnel remained confident in the new system even when coming across new types of errors caused by the introduction of MDD. Unfortunately, the introduction of new errors is quite common when new technology or changes in routines are introduced [20–23].

GPs indicated that they were content with the introduction of MDD. We know from earlier studies that GPs are not always conscientious in keeping up their medication records [24–26] and this was also reaffirmed through the interviews. The GPs as well as the medical secretaries would not always trust the medication records of their GP colleagues. Some patients are well known to their GPs through continuous and frequent encounters over time and studies have shown that GPs are very rational both with regard to how and with regard to what they document for their own sake in the EHR [27]. On the other hand, the GPs were pleased with the new and more extensive cooperation with the pharmacy introduced by MDD. A recent study on the value of physician/pharmacist/nurse cooperation in nursing homes has shown impact on optimizing medication use [28].

Nurses were anxious about losing their skills as good observers of patients. One could attempt to compensate for uncertainty in new technology either by keeping up old routines in parallel, or by trying to find other ways of obtaining the same information [13]. Additionally, the tasks that belong to their role are many and integrated. Planners sometimes underestimate the extent to which taking away one task might have unintended and negative effects on others [20]. The nurses might be justified in expressing scepticism towards the new system [29]. On the other hand, some would claim that the discontent from the nurses is more about the protection of their own role rather than scepticism towards the MDD system.

Future research

The nursing role has previously been described as the last defence in a safety net to prevent errors [30]. Our group of nurses reported that less attention was paid to medications after the introduction of MDD. Instead the pharmacy was highlighted as a new safety net. More research is needed to look into the consequences of this potential change in responsibility. The significance of new types of errors following the introduction of MDD also needs further investigation.

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Ethics

The study was approved by the Regional Committee for Medical Research Ethics (REK) and the Norwegian Data Inspectorate (NSD).

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Competing interests

The authors declare no competing interests.

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Paper III

GPs' prescription routines and cooperation with other healthcare personnel before and after implementation of multidose drug dispensing

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ORIGINAL ARTICLE

GPs' prescription routines and cooperation with other healthcare personnel before and after implementation of multidose drug dispensing

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Abstract

Background: This study addresses GPs' attitudes towards multidose drug dispensing before and after implementation and their perceived experience of how multidose drug dispensing affects prescription and communication routines for patients in the home care services. This study contributes to a method triangulation with two other studies on the introduction of multidose drug dispensing in Trondheim. *Methods:* A controlled before-and-after study carried out in Trondheim (intervention) and Tromsø (control). A questionnaire was distributed to all GPs in the two towns in 2005 with a follow-up questionnaire in 2008. *Results:* The GPs in Trondheim showed a positive attitude to multidose drug dispensing both before and after the implementation. Increased workload was reported, but still the GPs wanted the system to be continued. Most of the GPs reported a better overview of the patients' medication and a supposed reduction in medication errors. The GPs' prescription- and communication routines were changed only for the multidose drug users and not for the other patients in the home care services. ***Conclusions:*** **The study supports the results presented in two previous publications according to GPs' positive attitude towards multidose drug dispensing, their better overview of the patients' medications, and improved cooperation with the pharmacy. This study adds to our understanding of prescription routines among GPs and the use of the medication module in the electronic health record.**

Key Words: *Care coordination, electronic health records, general practice, home care service, multidose drug dispensing*

Background

With multidose drug dispensing (MDD), patients receive their drugs in machine-dispensed dose units, packed in disposable bags. The dose unit bags are labelled with patient data, drug content data, and time for intake [1–3]. For patients receiving multi-dose-dispensed drugs, all prescriptions issued by the patients' GPs are ordered through a local pharmacy, which electronically forwards the total orders to an MDD supplier. Dispensed drugs are returned to the pharmacy, and home care services deliver the dose units to the patients [4]. For patients using home care services, each supply of drugs usually covers 2 weeks of use. In 2011 there were about 53,000 users of multidose-dispensed drugs in Norway. Three out of four of these users were patients using home care services [5].

Residents in Norway are entitled to a regular GP [6]. Formally, these GPs are required to keep updated medication records for all their patients, including changes that derive from visits to hospitals or other physicians. Home care services offer assistance with medication for patients living at home; this makes

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Table I. Themes in the questionnaires and example questions.

Theme	Example question	Response categories
Responsibility	Does the EHR clearly indicate that the home care services handle the medication for the patient?	Always, mostly, sometimes, never
Prescription management	Are the drug requisitions from home care services cross-checked against the medication record in the EHR?	Routinely, only when in doubt
Communication	Does the patient get a copy of the medication record in the EHR when changes have been made during the consultation?	Always, mostly, sometimes, never
Expected/experienced changes	Overview of the patient's drug use	More, unchanged, less

EHR, electronic health record.

the nurses in the home care services responsible for the administration and observation of patients' drug use. However, GPs and home care services are separate organisations in primary care in Norway. They are usually not located together and they keep separate medication records. To avoid adverse drug events, home care services rely on close collaboration with GPs and pharmacies [7–9]. The need for cooperation between different groups of health personnel and coordination of tasks related to medications is even stronger under the MDD system [1,10–12].

Medication errors are any errors in the process of prescribing, transcribing, dispensing, or administering a drug [13]. Research shows that errors resulting in preventable adverse drug events most often occur at the stage of ordering [14]. The prescribing of drugs includes prescribing decisions and prescription writing, and errors occur in both parts of this process [15]. In this study, we focused on the prescription writing part of the process.

Aims

The aims of this study were to investigate (1) GPs' attitudes and experiences gained in relation to the introduction of MDD, and (2) GPs' prescribing, communication, and collaborative work routines before and after the implementation of the system. This study contributes to a method triangulation, i.e. checking the validity of the findings from two other studies by cross-checking them with another.

Materials and methods

The introduction of MDD in Trondheim (intervention) was organised by the municipal healthcare management and gradually adopted in 2006. Unlike most other municipalities in Norway using MDD, Trondheim decided to use the GPs' medication record in the electronic health record (EHR) as the master medication record. Hence, other health personnel had to manually update the medication record in their own EHR in accordance with the GPs'. According to the local routines, only the patients' regular GP was allowed to prescribe drugs for inclusion in the patient's multidose drug packages.

In order to assess the influence of MDD on medication practices from a professional perspective, a questionnaire survey for comparison was carried out. The city of Tromsø was strategically selected as a control. Tromsø (67,000 inhabitants) and Trondheim (170,000 inhabitants) are two medium-size towns in Norway. They both have a large university hospital and are the administration centres in their respective regions. Both towns have been in the forefront of introducing information and communication technology in primary care. However, the one important difference was that Tromsø had not planned to implement MDD.

When MDD was implemented in the home care services, Trondheim was organised in 27 home care units, compared to eight units in Tromsø. In total, about 1800 patients received assistance with the handling of drugs in Trondheim and approximately 800 patients in Tromsø. Five out of 17 pharmacies in Trondheim were involved as multidose drug providers. Tromsø had six pharmacies.

Questionnaires

A questionnaire was distributed to all GPs in Trondheim and Tromsø in 2005/2006 and in 2008. In Trondheim the total number of GPs was 123 (2005/2006) and 137 (2008), while in Tromsø the number of GPs was 52 in both years. The questionnaires had questions about prescription routines and communication and cooperation with home care services and pharmacies regarding medication (Table I).

The questionnaires had a multiple-choice design including optional free-text comments. The questionnaires were identical for both towns; however, only GPs in Trondheim (the intervention group) were questioned about experiences and expectations of MDD. In 2008, the GPs in Trondheim were asked separate questions in relation to their routines for follow up of patients with MDD and with ordinary prescriptions (OP).

Table II. Response rates and characteristics of the GPs in Tromsø and Trondheim in 2005 and 2008.

	Before intervention (2005)			After intervention (2008)		
	Trondheim	Tromsø	*p*-value	Trondheim	Tromsø	*p*-value
Response	82 (67)	39 (75)	0.37[a]	91 (66)	29 (56)	0.18[a]
Age (years)	46±10	44±10	0.35[b]	48±11	48±12	0.82[b]
Patients	1447±283	1273±289	0.003[b]	1385±327	1280±254	0.08[b]
Years in general practice	15±10	13±10	0.34[b]	16±11	17±11	0.65[b]
Specialists in general practice	50 (61)	27 (69)	0.50[a]	58 (64)	22 (76)	0.26[a]
Gender						
Women	Not asked	Not asked	–	24 (26)	12 (41)	0.13[a]
Men			–	67 (74)	17 (59)	

Values are *n* (%) or mean±SD. [a]Fisher's Exact test for difference in proportions. [b]Two-sample t-test for difference in mean values.

In Trondheim, the first questionnaire was distributed at a professional meeting, while the second one was sent and collected by mail. In Tromsø, both questionnaires were handed out and collected at the GPs' offices. One reminder was given after 3 weeks. All the responses were kept anonymous.

Statistical analysis

Descriptive and statistical analyses were completed using SPSS. Mean values and absolute and relative frequencies (%) are presented. A two-sample t-test was used to compare mean values of characteristics between the GPs in Trondheim and Tromsø. Fisher's Exact test was used to compare the distribution of categorical factors (proportions) between the years of assessment (2005 vs. 2008) and between towns (Trondheim and Tromsø). An ordinary logistic regression analyses was used to examine whether the difference in odds of changing routines (e.g. updating of medication records) from 2005 to 2008 differed for Trondheim (intervention area) and Tromsø (control area), technically represented by an interaction term in the statistical model. Separate analyses were performed for responses that related to MDD patients and patients with OP, respectively (defined for Trondheim only). *p*-values <0.05 were considered statistically significant.

Approval

The study was approved by the Regional Committee for Medical Research Ethics (REK) and the Norwegian Social Science Data Services (NSD).

Results

The response rates and characteristics from the GPs are listed in Table II. The only significant difference between Trondheim and Tromsø is the number of patients per GP in 2005. Out of 1800 patients in the home care services, 1500 were enrolled in the MDD system by the end of the study. This gave a mean of 11 multidose drug patients per GP.

Expectations and experiences

Table III shows a great concurrence between the GPs' expectations before and experiences after the implementation of MDD. There was only one significant difference before and after. Many GPs experienced the workload after the implementation of MDD to be heavier than expected.

Most GPs both expected and experienced MDD to give a better overview of the patients' medication and contribute to a reduction in medication errors. Cooperation with both home care services and pharmacies improved, and this was also expected beforehand.

Use of the electronic health record

Table IV presents information about how the GPs use the EHR when prescribing drugs to patients in home care services. Both in 2005 and in 2008, the GPs in Trondheim updated medication records in the EHR to a greater extent than their colleagues in Tromsø. The change in updating routines was not significant in either of the two towns, and neither was the difference in change showed by the interaction *p*-value.

In the second round, we also asked if the GPs in Trondheim recorded the information that the patient was a MDD user. The latter question indirectly gave the information that the patient got assistance with medication from home care services, since only patients in home care services used MDD at the time. In Tromsø, we found a significant increase over the study period of GPs who "always" or "usually" recorded in the EHR which patients received

Table III. Reported effects of multidose drug dispensing among GPs in Trondheim.

	Before intervention (2005)	After intervention (2008)	*p*-value
Overview of the patients' medications			
More	65 (82)	71 (80)	0.64[a]
No change	14 (18)	17 (19)	
Less	0 (0)	1 (1)	
Medication errors			
More	6 (8)	4 (5)	0.14
No change	13 (17)	26 (30)	
Less	56 (75)	56 (65)	
Cooperation with homecare services			
More	42 (56)	46 (52)	0.76
No change	29 (39)	36 (40)	
Less	4 (5)	7 (8)	
Cooperation with the pharmacy			
More	Not asked	69 (78)	–
No change		20 (22)	
Less		0 (0)	
Workload for the GP			
More	41 (55)	75 (83)	0.001[a]
No change	30 (40)	14 (16)	
Less	4 (5)	1 (1)	
Workload for the medical secretary			
More	23 (31)	38 (43)	0.21
No change	42 (57)	38 (43)	
Less	9 (12)	12 (14)	

Values are *n* (%). Fisher's Exact test for difference in proportions. [a]Two last categories combined to avoid frequency below five in the cross tabulation.

assistance. This was not the case in Trondheim for patients with OP, only for MDD users (Table IV).

More GPs in Trondheim reported that they consulted the EHR when prescribing to home care patients in 2008 than in 2005. The increase was significant only for MDD patients. In Tromsø the percentage consulting their EHR was higher at start than in Trondheim, but the percentage stayed the same. This made the change in routine in Trondheim significant compared to Tromsø.

The routines providing patients with a medication record printout changed in both towns, giving no significant change in the intervention group compared with the control group.

Other findings

The majority of GPs in Trondheim (81%) always or usually contacted the pharmacy when medication changes were made for multidose drug users. However, only 28% of the GPs did the same for patients with OP. The GPs in Tromsø did not communicate medication changes directly to the pharmacy in 2005 or in 2008.

Concerning which physicians should be allowed to prescribe multidose-dispensed drugs, 53% of the GPs in Trondheim indicated that only GPs should be allowed to do so. The other half would accept MDD prescriptions from physicians in hospitals, nursing homes, private specialists, or a combination of the above.

The majority of the GPs in Trondheim (69%) wanted MDD to be continued, while 7% (all men) did not, and 24% were uncertain. No differences were seen with regards to the age of the GPs, the number of patients on their lists, or whether the GPs were specialists in general practice.

Discussion

GPs in Trondheim reported an improved overview of their patients' medications and increased collaboration with other healthcare personnel after the implementation of MDD. Improved prescription routines were reported in both the intervention and the control group. The changes in prescribing routines reported for MDD users did not always apply to patients using home care services with OP. Despite the increased workload, most of the GPs wanted MDD to be continued.

Triangulation

This study contributes to a method triangulation. Table V shows what findings in this study are

Table IV. Reported routines related to the use of electronic health record (EHR) before and after implementation of multidose drug dispensing.

	n (%)	OR (95% CI)	Interaction *p*-value, Trondheim vs. Tromsø
Updating the medication record in EHR			0.81
Trondheim			
2005	36 (43.9)	1.00[a]	
2008	50 (61.7)	1.64 (0.90–3.00)	
Tromsø			
2005	6 (15.4)	1.00[a]	
2008	6 (20.7)	1.44 (0.59–3.47)	
Recording in EHR that the home care services handle the patient's medication			OP: 0.032; MDD: 0.051
Trondheim			
2005	29 (35.8)	1.00[b]	
2008 OP	39 (45.3)	1.49 (0.80–2.77)	
2008 MDD	79 (88.7)	14.17 (6.37–31.51)	
Tromsø			
2005	20 (51.3)	1.00[b]	
2008	24 (82.9)	4.56 (2.02–10.28)	
Consulting the EHR when prescribing to patients in home care services			OP: 0.54; MDD: 0.005
Trondheim			
2005	44 (53.7)	1.00[c]	
2008 OP	57 (64.0)	1.54 (0.83–2.84)	
2008 MDD	78 (85.7)	5.18 (2.50–10.75)	
Tromsø			
2005	28 (73.7)	1.00[c]	
2008	22 (75.9)	1.12 (0.51–2.47)	
Providing printouts of medication records in the EHR when changes are made during consultation			OP: 0.071; MDD: 0.10
Trondheim			
2005	26 (31.7)	1.00[b]	
2008 OP	44 (48.4)	2.02 (1.08–3.75)	
2008 MDD	45 (50.6)	2.20 (1.18–4.11)	
Tromsø			
2005	6 (15.4)	1.00[b]	
2008	14 (48.3)	5.13 (2.30–11.45)	

EHR, electronic health record; MDD, multidose drug dispensing; OP, ordinary prescriptions. [a]OR for response category "Always". [b]OR for response category "Always" and "Usually". [c]OR for response category "Routinely".

supported by findings in the two previously published studies [16,17]. The use of both qualitative and quantitative methods is advocated to help explain findings. This approach may be particularly appropriate for the evaluation of patient safety interventions [18].

The GPs reported an improved overview of the patients' drugs. This finding corresponds to findings in the parallel quantitative study of medication records showing a reduction in discrepancies between medication records at the GP's office and in the home care services when MDD was introduced [17]. This may be explained by MDD's capability of encouraging enhancement of communication between other healthcare personnel and GPs about prescriptions. The improved flow of information from home care nurses and pharmacists to GPs was confirmed in the qualitative study about trust between the collaborating partners [16].

The GPs in Trondheim were better at updating medication records in the EHR than their colleagues in Tromsø even before the implementation of MDD. The high initial level of updating could explain why the reported improvement in the updating of medication records in this study did not become statistically significant. Still, the study of discrepancies in medication records in Trondheim showed a reduction in discrepancies during implementation [17]. In 2003, a study from Trondheim was published that showed a great number of discrepancies between the medication records held by GPs and home care services for the same patients [19]. The study drew a lot of attention to medication errors in Trondheim just prior to our study and may have contributed to our results. Given all this earlier attention, one may assume the possible room for improvement was somewhat reduced.

Table V. Findings in the different studies contributing to the triangulation method.

Findings	Study I (controlled before–after study of discrepancies in medication records)[17]	Study II (qualitative study based on focus group interviews)[16]	This study (controlled before–after questionnaire study among GPs)
Improved updating of medication records by the GPs during implementation of MDD	Yes	Yes	No
Increased overview of the patients' medications	Yes	Yes	Yes
Increased cooperation between the GPs and the pharmacy concerning the medicating of MDD patients	Yes	Yes	Yes
Improved communication between health personnel regarding prescriptions in the MDD system	–	Yes	Yes
GPs assumed greater responsibility for the medications of their patients when enrolled in the MDD system	–	Yes	Yes
The GPs trusted the MDD system	–	Yes	Yes
The GPs wanted the MDD system to remain in use	–	Yes	Yes
Increased workload for the GPs	–	Yes	Yes

–, Not asked.

The increased involvement of the GP and improved routines in the handling of medications for MDD users, according to our findings, did not necessarily apply to patients in home care services with OP, neither in terms of consulting their EHR nor in collaborating with the pharmacy. For patients with OP, nurses in home care services can make changes in medications based on other physicians' prescriptions without involving and consulting the patient's regular GP. This implies that the introduction of MDD forced the GPs to assume greater responsibility for the medication of their patients. This finding agrees with our qualitative study, in which both GPs and pharmacists experienced a greater influence and improved quality in the handling of drugs after the implementation of MDD [16]. Changes in routines with the use of MDD seem to support the view that it leads GPs to pay more attention to the complete medication record rather than just single prescriptions [10]. On the other hand, the finding that 47% of the GPs reported that other physicians should be able to provide prescriptions to their MDD patients somewhat contradicts this.

Strengths and limitations

This study has examined an intervention at the organisational level, which meets the criteria designating a complex intervention [20]. The methods and statistics commonly preferred in connection with interventions are difficult to apply to complex interventions in large organisations. It is also recommended that one should be flexible and adapt the protocol to local conditions [20]. The results presented stem from a single implementation and should thus only be generalised with great caution. The strength of the study lies in the use of method triangulation.

Some of the results presented lack statistical significance. An increased number of informants could have changed that. The control group could have been made larger by including other towns, but it would also introduce greater variety and potentially more confounders [20]. In a controlled before-and-after design, one should require a minimum detectable effect size of 30% [21]. This is not seen in any of the non-significant results. Increasing the number of doctors would thus probably not add new information. Recruitment of large comparable organisations is very difficult, and was, moreover, beyond the resources and capabilities of the project.

The questionnaires were distributed differently in Trondheim in 2005 and in 2008, as described in the method section. Nevertheless, the response rates were high on both occasions and there are no indications that this change affected the answers. The wording of the questions is crucial when it comes to valid answers, and we cannot exclude the possibility that some responders may have misinterpreted single questions. Minor changes in layout and wording in the questionnaires may have contributed to this.

As the questionnaires were answered anonymously, it was not possible to directly link the answers from 2005 with those from 2008. The statistical testing is performed with tests on independent samples, even though the GPs were mainly the same.

To our knowledge, no systematic intervention in drug prescribing took place in Tromsø during the study. Still, we observed that some routines seemed to have changed more in Tromsø than in Trondheim (Table IV). Actually, some of the GPs' routines in Tromsø and Trondheim became more similar over the course of the study. This was the case for the routine for handing out printouts of the medication record to the patients (Table IV). Hence, it is possible that other external causes or confounders might have overshadowed some effects of the introduction of MDD. This could have been partly avoided by running the after study closer in time to the implementation, but that would have placed the findings in danger of being influenced by start-up problems. The GPs' change of routines may also be attributed to the Hawthorne effect in both places. This is also one of the reasons why it is important to establish a control group when the results of an intervention are assessed [22].

Regulation of the prescription of multidose-dispensed drugs

In Trondheim, the authorities decided to restrict the power to prescribe drugs for inclusion in the multidose bags to the patients' regular GP. This was in contrast to what has been done in other sites in Norway where MDD has been implemented. After having tried MDD, only half of the GPs were in favour of restricting multidose drug prescribing to GPs. A Swedish study has similarly shown a great variation among GPs in their opinion of who should be responsible for patients' drug lists [23].

However, having more than one physician involved in the patients' care is associated with higher risks of medication errors [24,25]. This has also been the case using multidose-dispensed drugs [26]. Similarly, in a recently published Norwegian questionnaire study with 54 GPs, a majority of the GPs reported an improved overview of patients' drugs in the MDD system, but comments from some of the physicians indicated that MDD works best when the patient's regular GP alone is responsible for the medications [27]. This feedback seems to support the local regulation made in Trondheim restricting the prescription of multidose-dispensed drug to the patient's GP.

The GPs wanted MDD to be continued

It is interesting to note that a majority of the GPs wanted MDD to be continued, even though the GPs experienced an increased workload after the implementation of MDD, which exceeded the GPs' prior expectations. A Finnish study concluded that policies that reduced job demands and increased job control would probably lead to an increased organisational commitment among GPs [28]. In our questionnaire, the GPs reported increased control, as they experienced a better overview, a supposed reduction in medication errors, and improved cooperation with other health personnel.

The implementation process

The positive attitude GPs in Trondheim reported towards MDD has not been reported in other studies [12,29]. One reason may be that Trondheim was able to involve GPs to a greater extent than in other places where MDD has been introduced. The importance of information work and involvement when implementing new technologies, are highlighted in the literature [30]. It is important to create expectations and responsibility towards the routine changes demanded by the new technology.

We would argue that the pharmacy became an important communication partner within the MDD system. This has also been reported by others [10]. In another study, GPs reported uncertainty over whether the pharmacy or the home care services should be notified of new prescriptions and changes in medications, because the different home care units had different routines [29]. Using a system in a collaborative setting requires a systematic approach by and towards all participants involved. The establishment of common and well-known routines seems to be an important factor in successful MDD implementation, and direct communication should be encouraged.

Conclusion

GPs in Trondheim welcomed MDD despite the increased workload. Implementation of the system improved prescription practices and communication and collaboration between the different healthcare personnel involved. Restricting the right to prescribe multidose-dispensed drugs to the GPs probably made the GPs take a greater responsibility for the patients' medications. The divergence in attitude towards MDD among GPs in different studies needs more attention, and further research may also be needed to refine the process of implementation of MDD.

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